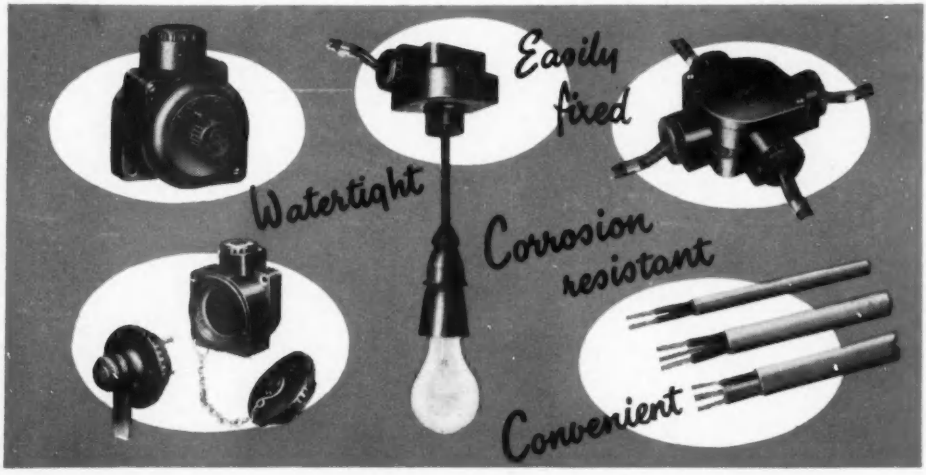
ELECTRICAL TIMES

THURSDAY
5 FEB.
1953
NINEPENCE



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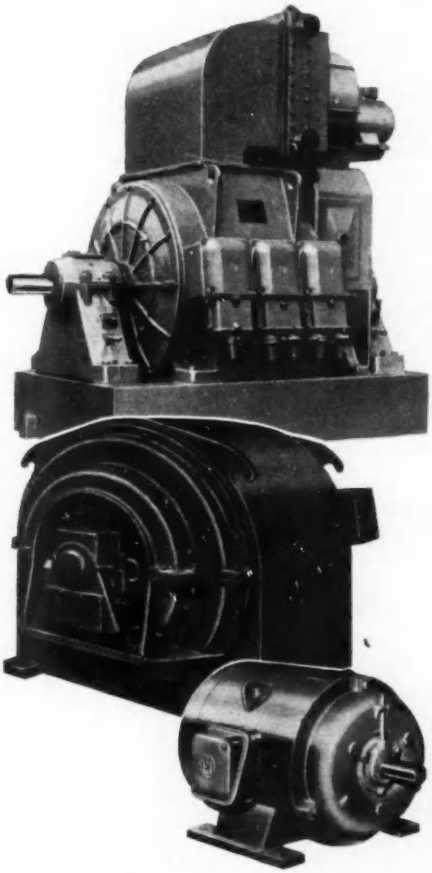

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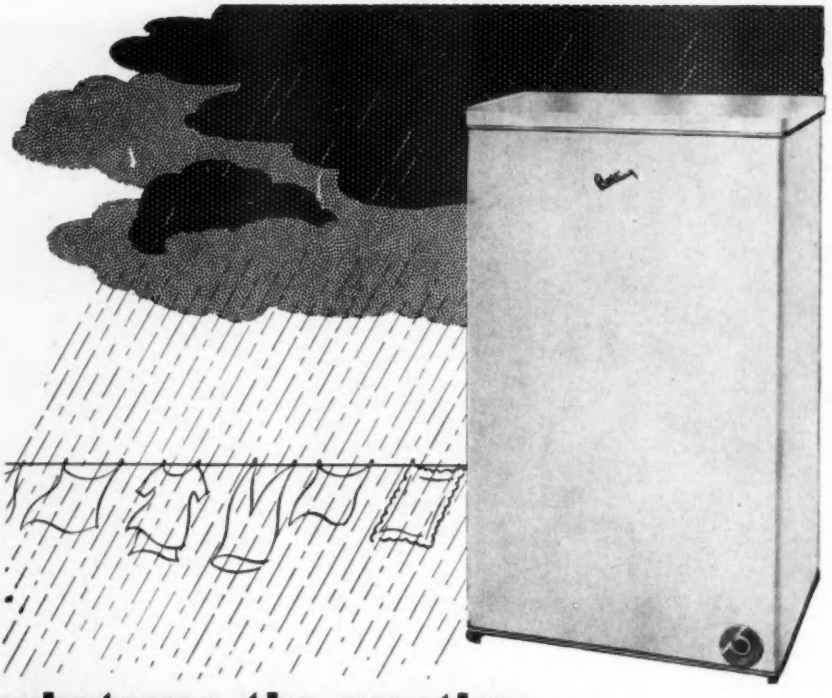

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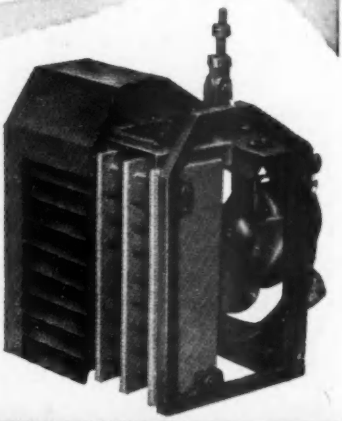

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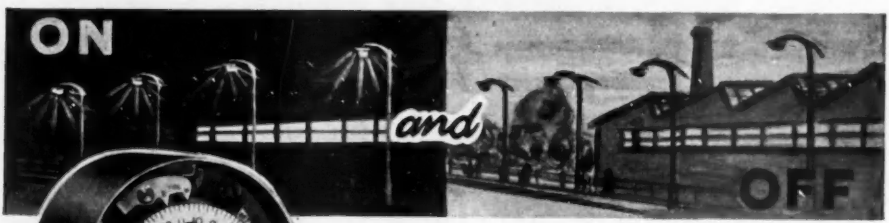

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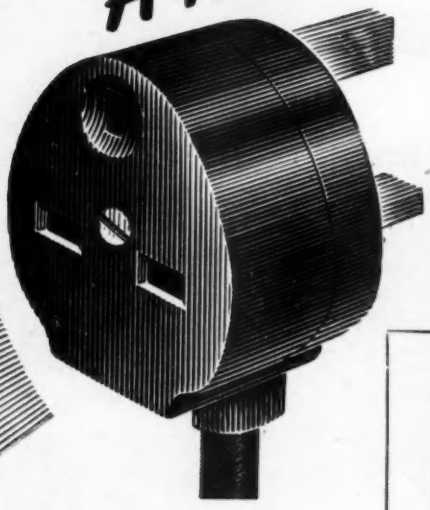
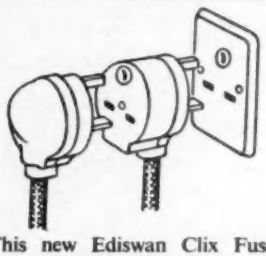


The plug adaptor fits any standard outlet made to B.S. 1363. It incorporates the same simple re-fusing device as is used in the standard Ediswan Clix B.S. 1363 Fused Plug, and the adaptor outlet is shuttered. The re-fusing operation takes only 15 seconds and can be done without dismantling the plug.



This new Ediswan Clix Fused Plug Adaptor can be wired to an appliance in place of a normal plug. A second appliance can then be operated from the Adaptor outlet.

	Cat. No.	*Price*	
Brown	6008	7/-	each
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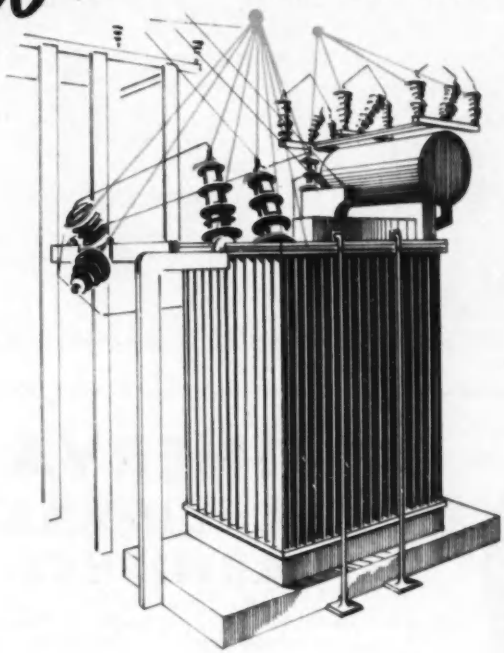

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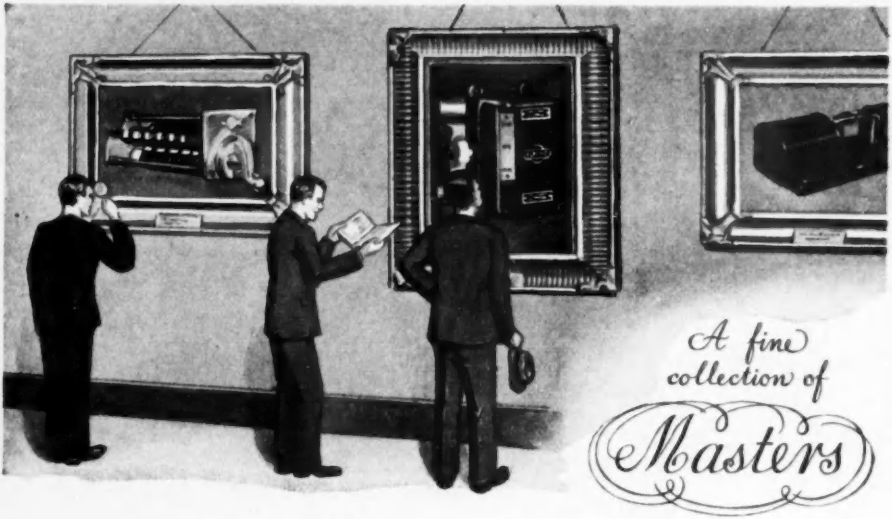

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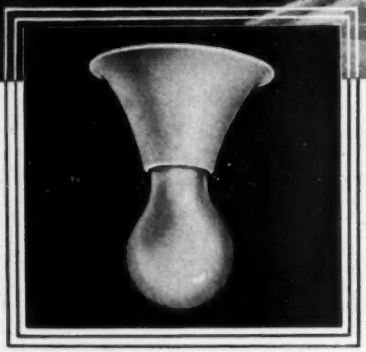

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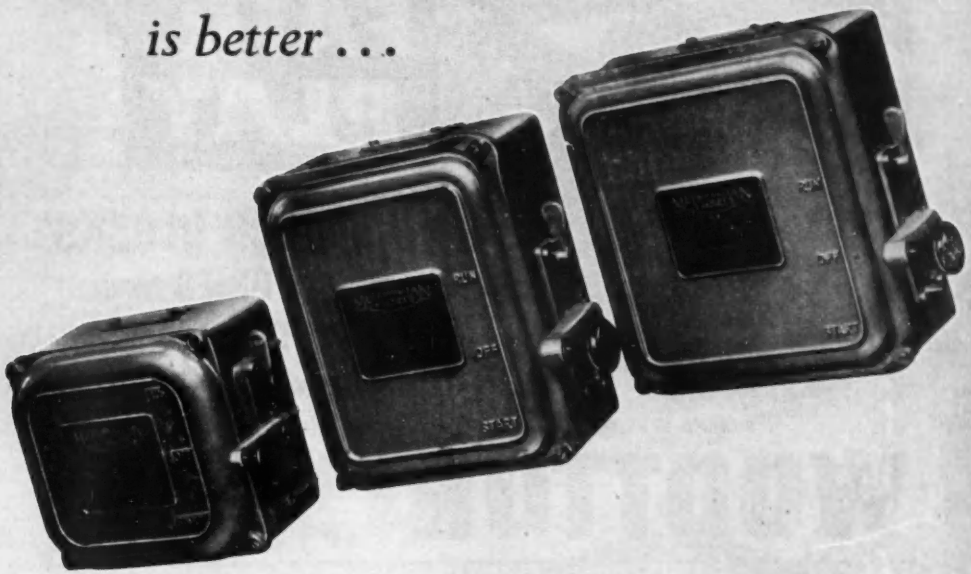

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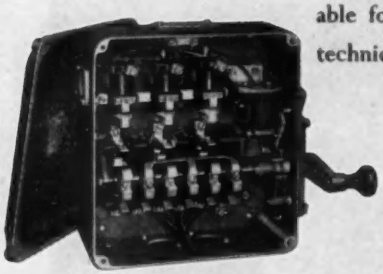

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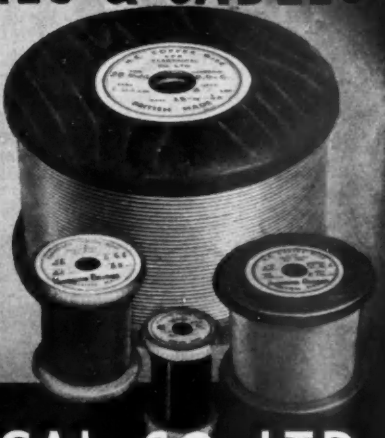

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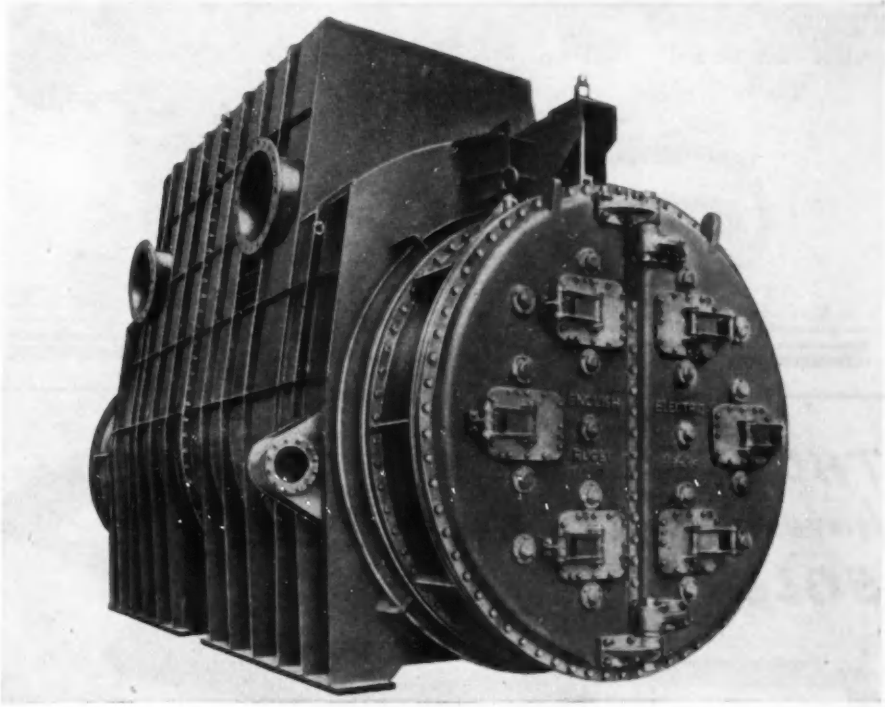

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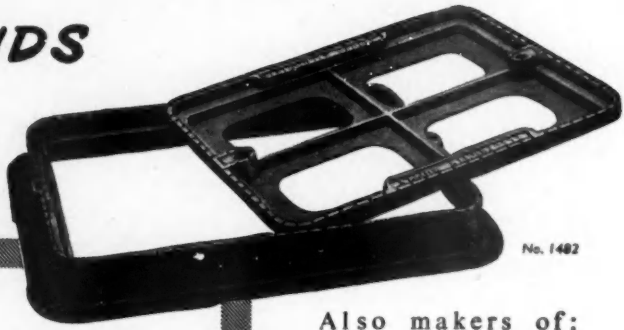

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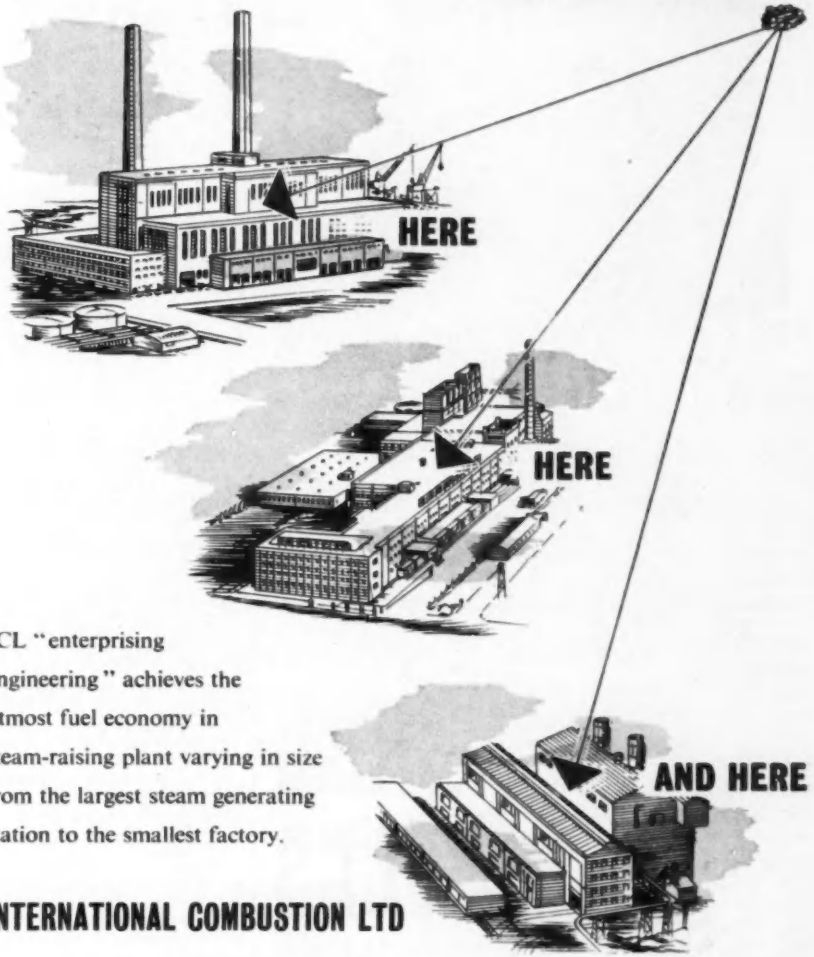

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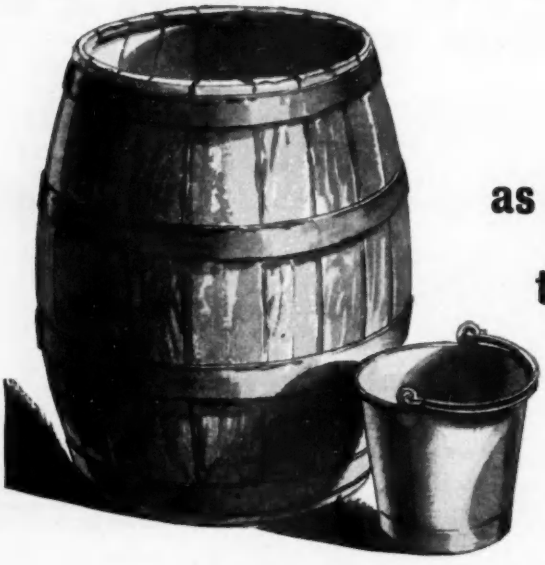

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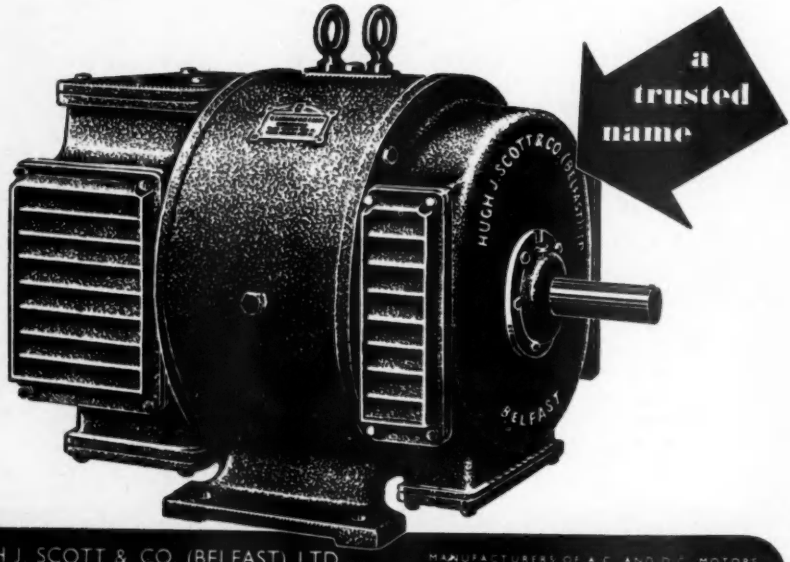

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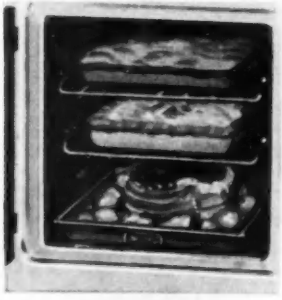

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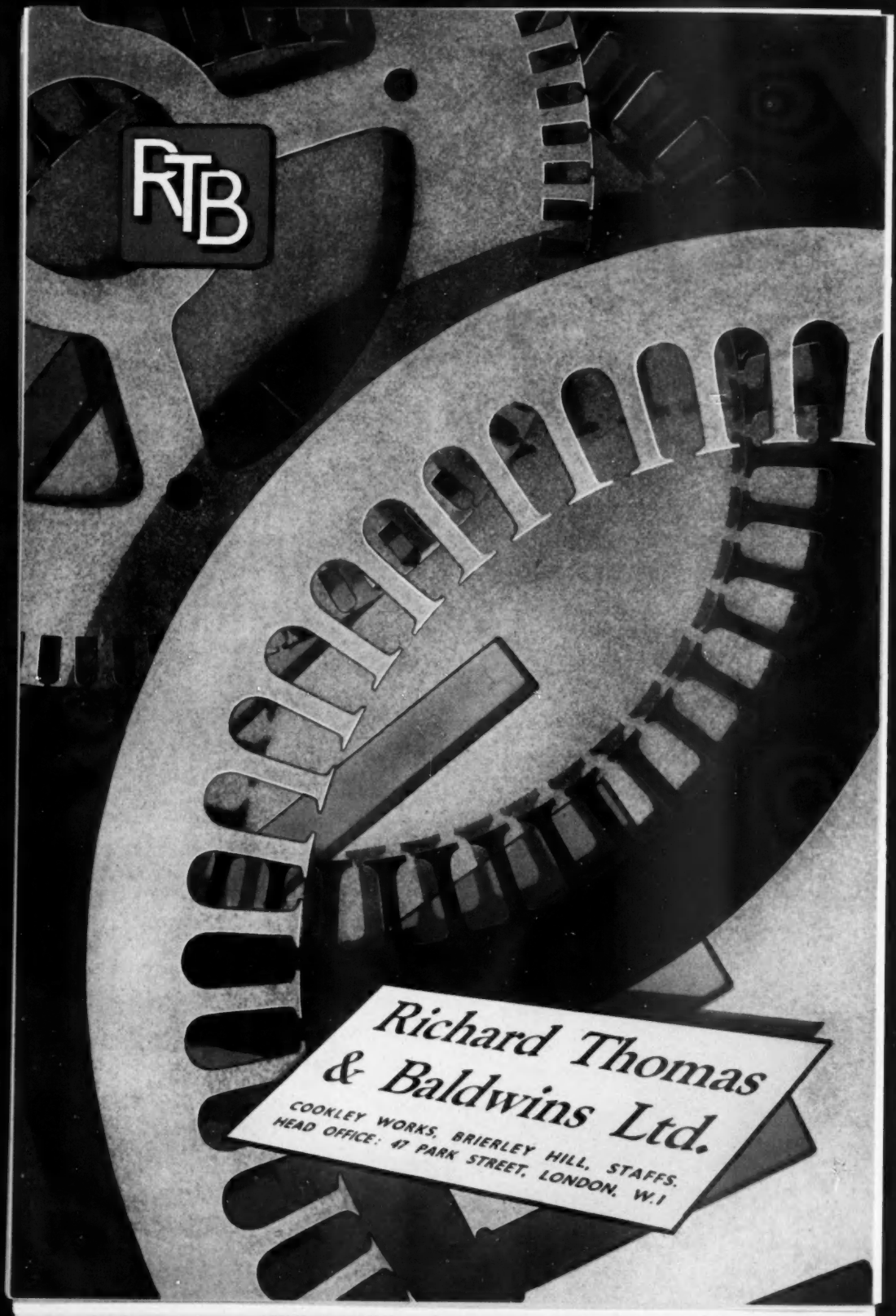
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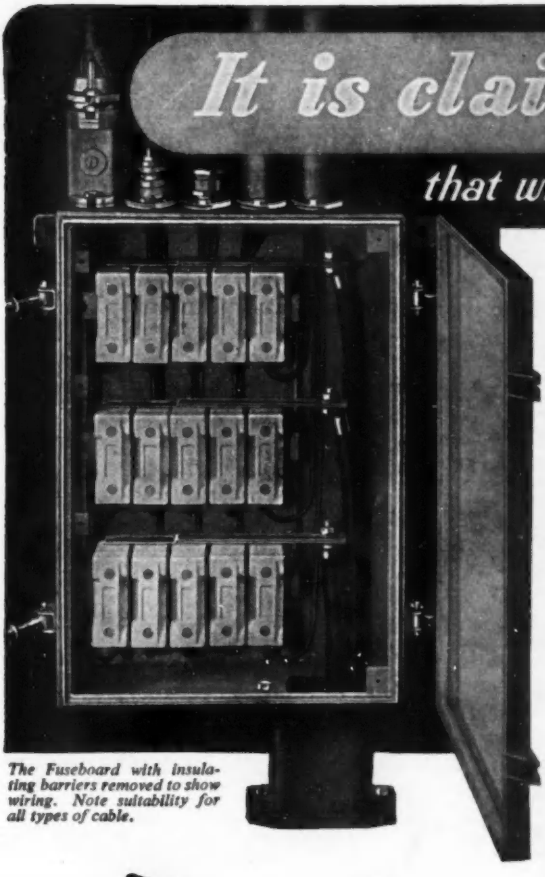

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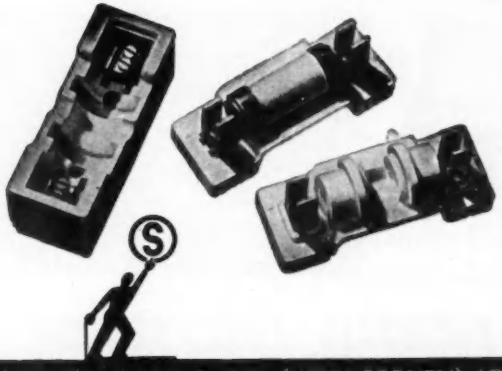

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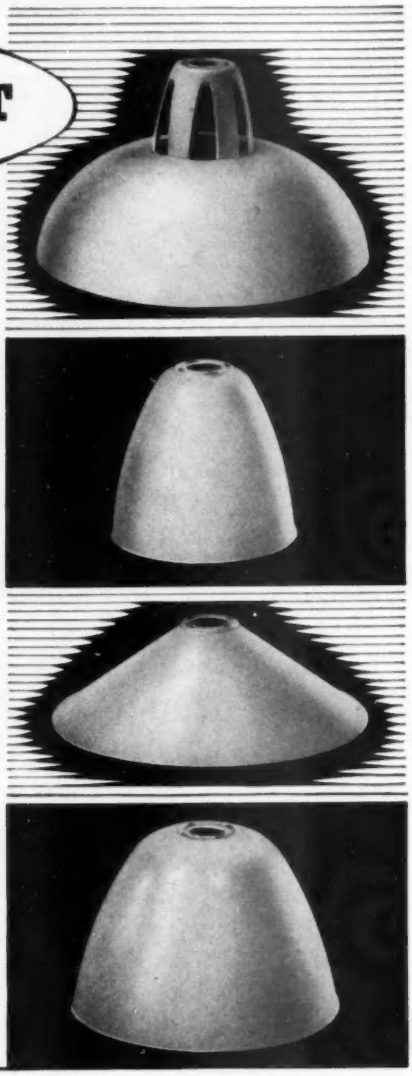

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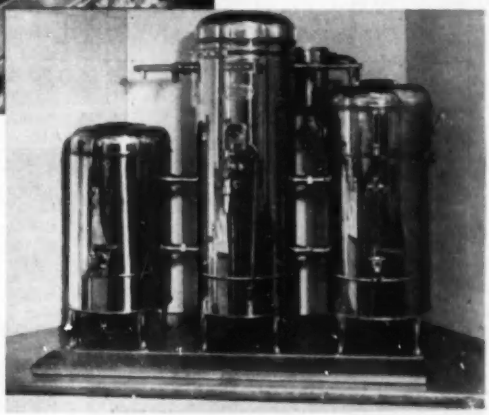

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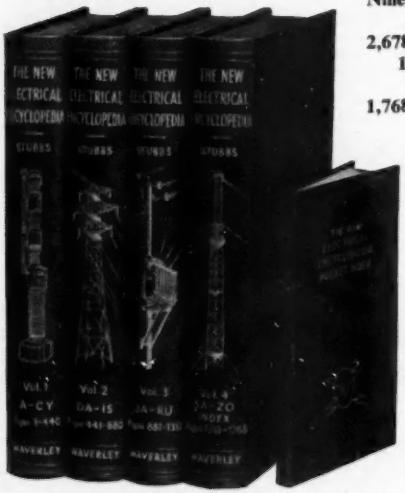

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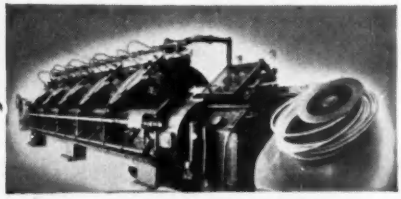

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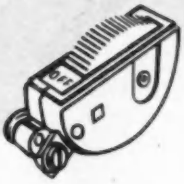

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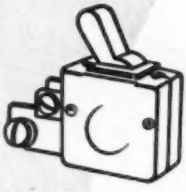

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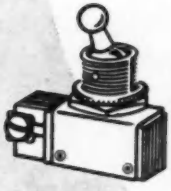

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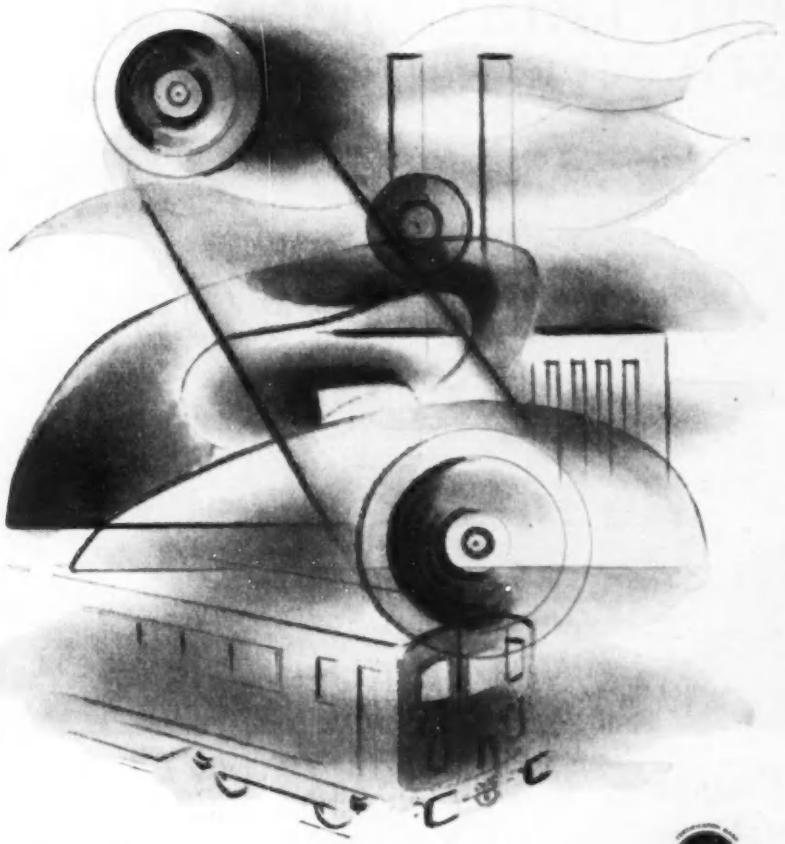

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B.Sc. (Eng.), A.C.G.I.

ESTABLISHED 1891

SUBSCRIPTION RATES—United Kingdom and Overseas £2 10s. 0d. per annum. Canada C$7·50c., U.S.A. $7·50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies are obtainable, price 9d. each.

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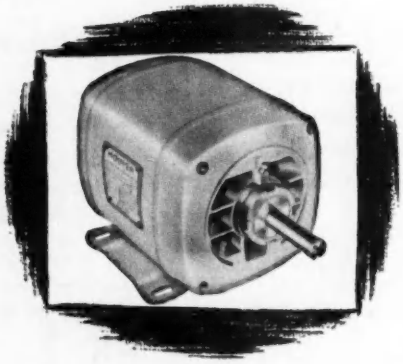

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Editorial

TWO-EDGED TAX

IT was no surprise at the Electrical Contractors' Association annual dinner last week to hear a general attack on the heavy level of taxation that is troubling industry. In the speech of Mr. Trace, the E.C.A. President, this culminated in a two-pronged assault upon the present imposition of purchase tax as it affects the electrical retailer. The electric fire, bearing a double burden since the penal increase in tax rate was applied during the last fuel crisis, provided an illustration for both his points. There is no logical case for the retention of this rate of tax now, with the supply industry finding it necessary to search around for custom, and the reputation of solid fuel's greater economy has been undermined. Yet if this argument is carried through to its desirable conclusion, and the tax reduced or removed, another problem arises. Is the retailer to be forced to pay heavily for release from one of his shackles, by bearing a heavy loss on the stock he is holding (P.T. paid) when the impost is dropped? The approach of Budget-time brings little hope that logic will have its way this year, but it does offer a reminder that a fair solution to this difficulty is still awaited. Considerations, both of the health of the electricity industry and of national fuel economy, demand that purchase tax on fires and other electrical appliances shall be cut, and eventually such action will have to be taken. When the time comes, it must not prove another expense to those who sell such equipment.

SHORT-CIRCUITS ON THE GRID

WITH the growing tendency towards ever higher potential fault currents on large interconnected networks, it is increasingly plain that short-circuit testing stations are becoming less capable of meeting the requirements of switchgear manufacturers. From time to time, however, the suggestion has been put forward that this country should have network testing facilities similar to those existing abroad. Specific examples of such arrangements are those afforded by the French Fontenay station and the Tidd (America) test site—where circuit-breakers can be proof-tested under most onerous conditions on an existing network. A hint that this deficiency may possibly be made good in the near future was, however, given by Mr. D. P. Sayers in his contribution to a discussion at the I.E.E. last week, when he stated that the B.E.A. were prepared to help manufacturers by providing large-scale facilities for switchgear testing on the Grid. Such collaboration has been long overdue, and if, as it is reasonable to suppose, the test site will be located at a large 275/132 kV substation, British manufacturers will be able to use these facilities and take full advantage of the overseas trend toward transmission voltages of 200 kV and above.

INVERSION IN ALTERNATORS

THE form of construction for large and medium-sized alternators is clearly established: an armature wound on the stator is demanded by technical and economic considerations, while the choice between a cylindrical and salient pole rotor for the field unit is determined by speed and mechanical requirements. For small machines, however, having outputs up to a few hundreds of kVA, the position is far less certain and, in some designs, the rotating armature more familiar in d.c. practice makes its appearance in spite of the inherent disadvantage of slip-rings carrying the load current. There has been much discussion during the past few years on this question of "inversion," as it is known, and to present the conflicting arguments to the engineer who is the user rather than the manufacturer of such machines, we are this week publishing a general article on the subject. No firm conclusions are possible as to the relative merits of the two

methods, and individual designers will continue to have their own preferences, coloured, no doubt, by the tradition and experience of the firms they serve. In a field, however, in which important developments have taken place recently, the arguments involved are of some importance to the potential purchaser.

EDUCATIONAL CHOICE

IT was seven months ago that the Chancellor of the Exchequer announced the Government's intention of building up some form of technological university. In the intervening months the debate on this reversal of the previous administration's decision has continued, though at a lower tempo. Now that the form which implementation is to take has been made clear, a resurgence of the controversy is likely. In selecting Imperial College for the large expansion which is necessary to build up the pre-eminent institution envisaged, the Government has made the obvious choice, for the College is already the country's largest technological establishment. Moreoever, its geographical separation from the rest of London University has always set it apart, so the rapid expansion planned—a doubling of the student body in a five-year period—should not have too disturbing an effect on the University as a whole. This in turn has much to contribute to the new super-college. Thus, while the case for a British "Massachusetts Institute of Technology" may still be questioned, the choice for its realisation is not unacceptable.

GRID FOR AMERICA

BULK transmission of electricity at 500 kV over 22 western states of the U.S.A. has been recently advocated by Government agencies in America. This visionary plan has many features that parallel with problems now being studied on this side of the Atlantic. Foremost amongst them is the decision to transmit electricity for hundreds of miles rather than to handle coal over that distance. Comparatively low-grade coal and lignite will become necessary fuels for Western American economy in a few decades, to serve an area that can at present satisfy over half its demand from hydro sources. Transmission distances will be near the upper limit of present experience, with four to six hundred miles separating proved deposits of suitable fuel from the rapidly developing load centres in which a relatively early power shortage is forecast, and transmission voltages will be correspondingly high. With an expected minimum period of 25 years before the scheme could be fully developed, the exciting possibility exists that it might provide the occasion for a new and testing "battle of the systems."

STEAM FOR THE OUTPOSTS

INTERNAL combustion engines are an obvious choice where small prime movers are required on isolated sites. Yet although they are entirely satisfactory where the necessary fuel supply can be organised reasonably easily, situations arise overseas, notably in the Commonwealth, where this supply problem itself becomes a major consideration in judging suitability. This challenging state of affairs provides the background to an ambitious project of the National Research Development Corporation, which has taken up a suggestion made by Sir Harry Ricardo, the well-known designer of i.c. engines. He calls for no less than a new attitude to the design of light steam engines, with the incorporation in their construction of many of the lessons which have been learned in diesel and petrol engine design over the last few decades. Such steam engines, operated off boiler plant which could burn the low-grade fuels likely to be available in remote areas of undeveloped country, could provide a valuable and self-sufficient source of energy both by direct drive and also as the power unit for an electric generator. There is no doubt that this development is potentially important, though a precise evaluation of its prospects must wait until the likely size of the plant involved has been made clear.

Meteor

Small Alternator Construction

TWO QUESTIONS: Rotating Field or Armature? Distributed or Concentrated Windings?

By J. GRIFFIN, A.M.I.E.E.

THE publication and discussion of a recent paper[1] have to some extent revived controversy about the most appropriate construction for the small synchronous alternator. In textbooks the *rotating-field* (RF) construction is usually taken for granted; this "conventional" construction is certainly the most appropriate for alternators of medium and large outputs, but it by no means follows that it is also the best for rather smaller machines. In practice many small alternators, with outputs of up to 100-150 kVA, are "inverted," i.e., they are of the *rotating armature* (RA) construction. The following discussion of the merits of these possible alternative constructions, and of whether the field winding should be *concentrated* (salient-pole) or *distributed* (phase-wound), is intended to be of some help to the non-specialist engineer interested in the controversy as a possible user or purchaser; it is also hoped, however, that sufficient detail has been included to make the discussion of some assistance to industrial machine designers with a more direct interest in the subject but with practical experience of only one type of construction.

ROTATING FIELD OR ARMATURE?

The more important of the two questions will be considered first; should small alternators have rotating or stationary field systems, and if the latter then up to what outputs and at what speeds?

The "inversion" of a synchronous machine is generally understood to mean the location of the armature winding on the rotating member. The resulting machine (assuming for the moment the salient-pole construction) is thus very similar to an ordinary d.c. generator; the only important differences are that the closed commutator-type armature winding is replaced by an opened a.c. winding (usually polyphase), and that the output is transmitted through slip-rings as alternating current instead of being rectified. Figs. 1*a* and 1*b* show in section the approximate proportions of the RF and RA constructions, and Figs. 2, 3*a* and 3*b*, are photographs of parts of modern machines.

Inversion—Advantages

The principal advantages of inversion are claimed by its protagonists to be as follows: (1) An exciting winding loss reduction. (2) An iron loss reduction. (3) Improved utilisation of active material.

These three points are clearly bound to be inter-dependent, and their relative extent will vary within moderate limits according to the skill and experience of the designer. The reasons for the improved performance claimed are usually presented in detail in some such manner as the following:—

(1) *Exciting Winding Loss Reduction.* In any alternator operating stably with the usual lagging power factor load the exciting (field) magneto-motive-force (m.m.f.) must always exceed the armature reaction m.m.f., the ratio $M_F : M_A$ at full load varying between 3 or 4 : 1 for very small machines to perhaps $1\frac{1}{2}$: 1 for larger machines. The logical place for the field winding is thus (it is said) on the stator, where there is available, for given flux densities, the greater winding space. Since a greater total

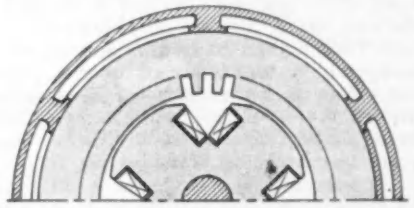

Fig. 1 (a)—Rotating field construction: Section through 4-pole SP RF machine

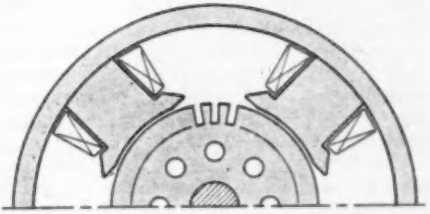

Fig. 1 (b)—Rotating armature construction: Section through 4-pole SP RA machine

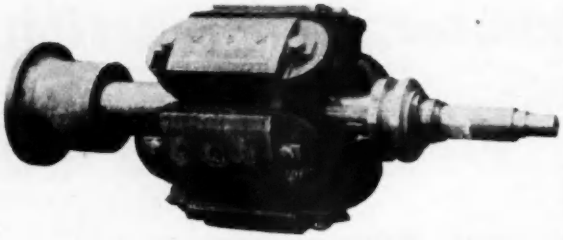

Fig. 2. Field system of small 6-pole SP RF machine

cross-sectional area (c.s.a.) of exciting winding copper can be accommodated in the greater winding space on the stator, there will be a reduction in the power loss in the exciting winding and corresponding reductions in the size and cost of the d.c. exciter.

The apparent converse, namely, that with less room on the rotor for the armature winding there will be an increase in armature copper loss, is not (it is claimed) equally valid. It can be seen from Fig. 1 that in machines with few poles the slot depth is only a fraction of the radial depth of the exciting winding, and the admitted armature copper restriction in the inverted machine is small by comparison with the field copper restriction with the RF construction.

2. *Iron Loss Reduction.*—For a given flux per pole, and a given permissible flux density, the total c.s.a. of core* iron is constant, irrespective of the method of construction; for a given axial core length, therefore, the radial depth of the core iron must also be constant. The iron loss in the core (for the given flux density and a given material) is proportional, however, to the total *volume* of the core. The core loss in the RA machine will therefore be less than in the RF, since owing to its smaller mean diameter the core of the former has a considerably smaller volume (see Fig. 1).

3. *Improved Material Utilisation.*—The limiting factor in the design of the RF alternator is nearly always the temperature rise of the exciting winding. Supporters of inversion claim that with the RA construction this limitation is removed, and the temperature rise of the *armature* winding (often well below the limit in RF machines) becomes the limiting factor; significant increases in armature loadings become possible, and the armature dimensions for a given output are reduced.

One further and interesting point about the inverted machine is its suitability for "self-excitation," though this is so special as hardly to be admissible as an actual advantage. A separate small d.c. armature winding and commutator can be added to the alternator armature, the d.c. winding occupying part of the deepened armature slots; special arrangements for utilising the alternator armature reaction to obtain "self-regulation" have been evolved[2], and numbers of small alternators embodying these arrangements have been built.

* "Core" is here used in its more restricted meaning of that part of the armature magnetic circuit *behind* the armature teeth.

Inversion—Disadvantages

The disadvantages of inversion, as presented by its opponents and to some extent admitted by its supporters, arise mostly from the need for the output current (as distinct from the exciting current) to be handled by the slip-rings and brush-gear. These disadvantages are summarised as follows: (1) A.C. collection difficulties. (2) Complexity and cost of rings and brush-gear. (3) Increased ring losses. (4) Impracticability of winding reconnection. (5) Impracticability for "high-tension" machines.

Supporters of inversion claim that some of the above "disadvantages" are in practice more important as factors limiting the outputs at which inversion remains technically and economically sound, rather than as positive disadvantages. More detailed consideration of the arguments in favour of the RF machine is generally along the following lines:—

1. *A.C. Collection Difficulties.*—Opponents of inversion claim that the slip-ring transmission of alternating current is inherently more troublesome than that of direct current; in practice there seem to be almost as many opinions on this subject as there are maintenance electricians! Supporters of inversion claim that with present-day ring and brush materials difficulties peculiar to a.c. collection are negligible; they instance the many small alternators (and larger synchronous induction motors) operating inverted, and they also point out that the RA machine is inherently free from the polarity troubles occasionally experienced with d.c. slip-rings.

2. *Ring and Brush-gear Complexity and Cost.*—Here there can be little doubt that the argument against inversion is technically sound. For a normal three-phase machine with a neutral point, the RA machine requires four slip-rings instead of the two (probably smaller) rings of the RF machine. Further, since the

output current of even a small alternator will normally exceed considerably the direct exciting current, the cost of each a.c. ring, and of the increased number or size of the brushes and brush-holders, is correspondingly greater.

3. *Increased Ring Losses.*—Here again the supporters of the RF machine are on firm ground. With twice the number of rings, with a necessarily larger brush contact area, and with heavier currents, the RA friction and brush contact losses exceed considerably those of the corresponding RF machine. Supporters of inversion concede this point, remarking, however, that slip-ring losses represent (even on an inverted machine) only a small proportion of the total.

4. *Winding Reconnection.*—There is some demand for machines capable of providing two different output voltage ranges (e.g. 380-440 V *or* 190-220 V). Generally speaking there is very little difficulty in providing this feature on an RF machine; the armature winding is stationary, and the necessary winding connections can thus be brought out to a terminal box, the appropriate interconnections for the voltage band required being made in the box by means of suitably designed links.

With the armature winding on the rotating member, however, it is necessary either to provide additional slip-rings or to adopt some form of rotating terminal board; the former solution is uneconomic (ten rings would be required for 3-phase series/parallel reconnection), and the latter presents obvious manufacturing difficulties for small machines or heavy currents.

5. *Limitation to "Low-Tension" Outputs.*—Rotating armature windings operating at 2-3 kV, and the associated slip-rings and brush-gear, are clearly inadvisable; for quite small machines they are completely impracticable. The RA machine is thus limited, for all practical purposes, to "low-tension" outputs, i.e. to a maximum output voltage of some 600-700.

SALIENT-POLE OR DISTRIBUTED FIELD?

This question has hitherto been much less controversial than the argument about the location of the armature winding; it is only very recently that any important or general superiority has been claimed for the distributed field over the almost universal "concentrated" or salient-pole winding (Fig. 4a). It should perhaps be explained that the "distributed" field winding is phase-wound (usually, though not invariably, with three phases), with coils occupying slots on the stator or rotor periphery (Figs. 4b and 5). This type of winding is the one normally employed for the secondary winding of the synchronous induction motor; the slots are usually (though again not invariably) of equal sizes and symmetrically distributed, and the radial air-gap length is uniform. Various methods of connecting a three-phase winding for d.c. excitation are available,[3] but for a given symmetrical winding the "excitation efficiency" (i.e. the ratio of fundamental m.m.f. to power loss) is independent of the method of connection.

Distributed Field—Advantages

The arguments usually advanced in favour of the distributed field winding are as follows:—

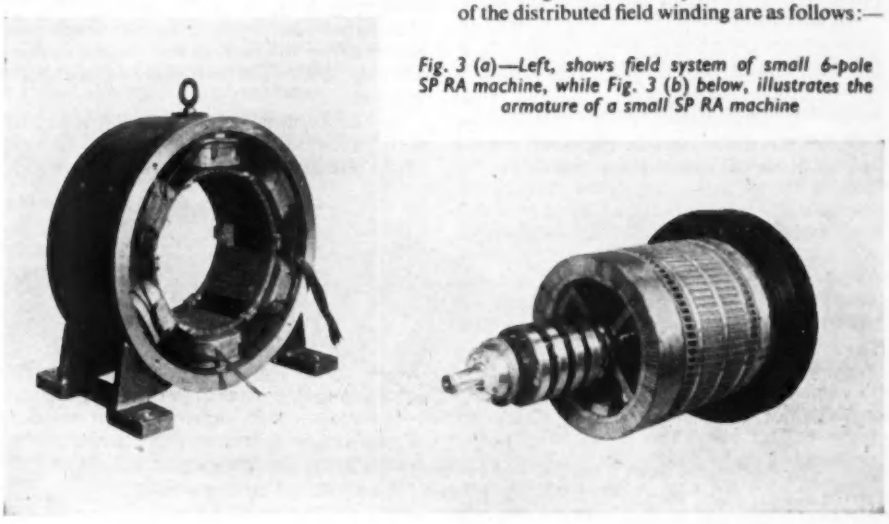

Fig. 3 (a)—Left, shows field system of small 6-pole SP RA machine, while Fig. 3 (b) below, illustrates the armature of a small SP RA machine

1. *Wave-form.*—The uniform air-gap, and the approximately sinusoidal m.m.f. space wave-form of the distributed winding combine to ensure an excellent alternator output voltage wave-form at all loads and power factors.

2. *Response.*—The distribution of the exciting winding into several coils per pole greatly reduces the inherent time-constant of the winding. This can result, *provided that a suitable and correspondingly responsive type of automatic voltage regulator is employed,* in very rapid response to load changes; transient departures from the controlled voltage are smaller and of shorter duration than is possible with a salient-pole machine.

3. *Damping.*—By using a suitable connection one or two phases of the distributed exciting winding can be so arranged as to provide very effective damping, thus eliminating the need for the separate squirrel-cage pole-face winding usually necessary in the salient-pole machine.

4. *Stray Loss Reduction.*—Reductions in the "stray" losses, consequent upon the improved wave-shapes of m.m.f. and flux and the negligible extent of armature reaction distortion, are claimed for the distributed-field machine.

5. *Economic RF Machines.*—Supporters of the distributed-field construction claim that it makes economically possible the manufacture of smaller (and slower) RF machines than are feasible with salient poles. Whether or not this is considered an advantage depends, of course, on the opinion held as to the merits of inversion.

An additional minor advantage of field distribution is a reduction in field leakage flux by comparison with the salient-pole machine.

Concentrated Field—Advantages

Supporters of the more conventional salient-pole method of construction claim, on the other hand, that some of the benefits obtained by distributing the field are illusory or insignificant, and that they are in any case outweighed by the inherent advantages of the completely concentrated exciting winding. Their arguments are generally as follows:—

1. *Cost.*—The salient-pole construction is claimed to be the cheaper in both material and labour. Instead of a multiplicity of coils (usually 6 or 9 per pole) to be assembled into a slotted core of electrical sheet steel, and then connected into groups and phases, the salient-pole machine requires only one cheaply wound coil per pole, pre-formed and pre-insulated; the pole body is normally of ordinary rolled steel or of c.r.c.a. laminations. The coils of the distributed field have perforce to be individually insulated from each other and from the core, whereas each salient-pole coil need be provided with but one thickness of insulation—that between conductor and earth.

2. *Excitation Efficiency.*—It can be shown[4] that the completely concentrated exciting winding necessitates a power loss (for a given fundamental m.m.f.) of only some 45% of that in the corresponding three-phase distributed winding, equal total copper c.s.a.'s and equal average turn lengths being assumed. In practice, it is claimed, this advantage is more than realised; it is true that provision must often be made for a separate squirrel-cage damping winding (and this is not, of course, without some effect on the cost), but the pole-tip is usually magnetically unsaturated and there is ample room for the damper bars. The salient pole can always accommodate, owing to the reduction in the total insulation, a rather greater c.s.a. of exciting winding copper per pole; in addition, the length of the average turn is considerably less than that of the corresponding distributed winding.

It will be appreciated that the RA versus RF and the DF versus SP problems are to some extent interdependent. The more independent

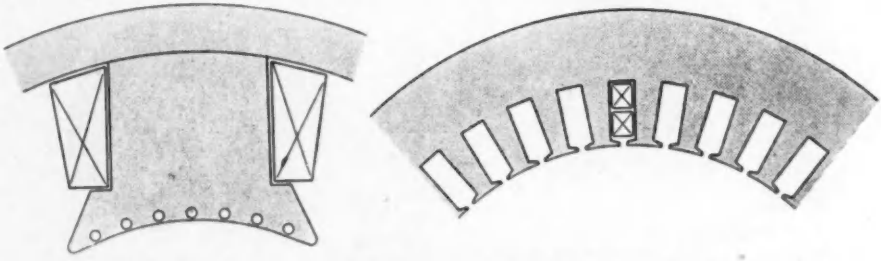

Fig. 4 (a)—Left, shows a concentrated (salient-pole) exciting winding, while on the right, Fig. 4 (b), is seen the stator stamping for a distributed exciting winding

considerations have been discussed; some advantages claimed for machines which are both inverted *and* salient-pole will now be briefly considered.

These additional advantages are very largely constructional, and the most important is that the inverted salient-pole machine requires no mechanical frame other than its yoke—the yoke, if of an adequate cross-section magnetically, is invariably sufficiently strong mechanically. For the RF machine (be it salient-pole or distributed-field) it is essential to provide an additional mechanical frame, serving no useful electrical purpose, merely to contain and support the laminated stator core.

The provision of a squirrel-cage damping winding on the SP RF machine weakens the pole-tips mechanically, and the end-rings and pole-to-pole interconnections may introduce further mechanical difficulties in even small machines operating at high speeds. It is an additional though minor advantage of the inverted SP machine that no such mechanical limitations are apparent, and the design of the damping winding can be settled from purely electrical considerations. A further minor advantage of the SP RA machine over its RF equivalent is a reduction in field leakage due to the longer circumferential leakage paths (see Fig. 1).

Possible further advantages are dependent upon the types of machine already in normal production. It will be readily apparent, from the similarity between the SP RA alternator and the ordinary d.c. generator, that considerable advantages (arising from the availability of existing yoke patterns, pole dies, armature lamination blanking dies, and so on) can be obtained by a manufacturer already producing a standard range of d.c. machines. The converse, namely, that an induction motor manufacturer will in turn have available mechanical frames, stator and rotor laminations, and so on, is equally true; supporters of the inverted salient-pole machine claim, however, that an existing d.c. frame is often better suited to the accommodation of (a) internal slip-rings and (b) the d.c. exciter.

The Limits of Inversion

The author believes, though he has endeavoured so far to present as fairly as possible the evidence for both sides, that inversion has definite advantages; some factual evidence in support of this conclusion will be presented later. The question arises, however, of up to what output limits, and at what speeds, any advantages exist. The output limit is dependent mainly upon the need for the alternating current output to be collected at slip-rings by brush-gear; the optimum speeds are influenced by the effect of the number of poles on some of the advantages.

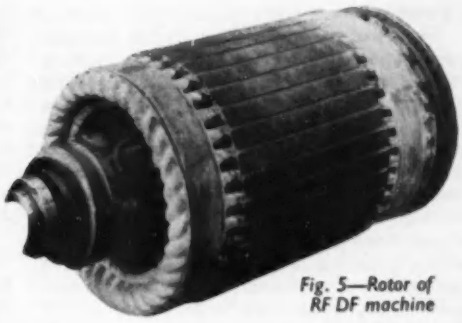

Fig. 5—Rotor of RF DF machine

The Output Limit

The additional size, cost and complexity of the slip-rings and brush-gear of the inverted machine are a direct consequence of the number of terminals required (about which nothing can be done) and of the magnitude of the output current. Satisfactory rings and brush-gear are available for currents of 500-600 amps and more, but the difficulties of accommodating such gear in small self-contained machines will be readily apparent; a balance has therefore to be struck at a point at which the increased cost of the gear begins to outweigh the advantages of inversion. Slip-rings for line currents as high as 500 amps are therefore confined, in general, to low-tension synchronous induction motors, where there are more pressing reasons for inversion; the current limit for the inverted alternator seems in practice to be about 200-250 amps. This corresponds to a maximum 3-phase output of 190 kVA at 440 volts, falling to 165 kVA at 380 volts. Special arrangements are necessary for the 220-230 volt band; the demand for these voltages is small (though definite), and the difficulty can usually be overcome up to outputs not seriously lower than those quoted above, though some additional expense is inevitably incurred.

The limitation of the inverted machine to low-tension outputs has no practical effect on the output limits; the limit set by the maximum slip-ring current is well below that at which the demand for high-tension alternators becomes significant.

Speed

The speed of the machine (or, to be more accurate, its number of poles) has an important influence on the advantages of inversion. With machines having more than six or eight poles the degree of "taper" present over the pole-pitch from the outside to the inside diameters is considerably reduced, and the relative restriction on the field winding space (and thus the incentive to locate the field winding on the stator) becomes much less marked. There is also a tendency, in machines with more than eight poles, for the iron loss in the armature *teeth* to become a much larger proportion of the total iron loss. Both these considerations limit the number of poles with which the advantages of inversion can be fully realised, and it is natural, therefore, for the upper output limit with a given number of poles to be set at the output obtainable with that pole number from the largest 4-pole frame. The lower limit will normally be set, for each pole number, at the lowest output at which there is sufficient demand for machines of the corresponding speed to make their manufacture worth while.

CONCLUSIONS

It is the opinion of the author, based on the arguments already considered and on experience of the design and manufacture of machines of all four of the possible combinations of RA, RF, DF and SP, that for small outputs and at the higher speeds the *rotating-armature salient-pole* construction is the most appropriate. The limits within which this is true are naturally less definite than the conclusion, but within these limits the preferred construction does produce (as will be shown) a cheaper and more efficient machine.

That there are exceptions to this rule there is no doubt. There are special applications for which exceptionally rapid voltage response is required (although it is suggested that such response is *essential* far less frequently than its specifiers appreciate), and here the very low time-constant of the DF machine is a real asset. Other special applications may require the particularly good wave-form of the DF machine (although here again it is open to question whether this requirement is not more often specified than needed), or the winding reconnection practicable only with the RF construction; however, the output wave-form of the commercial salient-pole alternator seems in practice to be satisfactory for the vast majority of applications,* and while dual-voltage machines may be useful in the Services, or for the convenience of a few overseas stockists, the demand for them is relatively small. (It is not suggested that this demand can be ignored, but rather that it can best be treated as a special case; orders for Services machines tend to be for large numbers of one type, and Service requirements, like those of customers abroad, are in any event often special in other directions.)

Regarding the slip-rings and brush-gear of the inverted machine no published statistics known to the author suggest that a.c. collection is in practice any more troublesome than that of d.c. Such opposition to a.c. collection as is engendered by actual users seems to be little more than prejudice; there are many thousands of machines in which a.c. slip-rings and brush-gear have been giving satisfactory service for years.

A Comparison

As evidence of the general superiority of the preferred construction the following table compares directly some of the performance and dimensional data of typical SP RA and RF DF machines. Space does not permit of direct comparisons between RA and RF salient-pole machines, or between DF and SP machines as such; precluded also is a detailed analysis of the designs on which the table is based.

The machines compared were all designed for an output voltage of 380-440 volts, 3-phase, and for a speed of 1,500 r.p.m. (4-pole, 50 c/s). Four different outputs between 45 and 125 kVA (so selected that the frames concerned were fully rated in every case) were considered; of these outputs two were obtained from "short-core" SP RA machines and "long-core" RF DF machines, and the other two were from "long-core" SP RA and "short-core" RF DF designs. It is believed, therefore, that the average ratios in the table may be taken as reasonably representative; the figure quoted is in each case the ratio of the SP RA machine quantity to the corresponding quantity in the RF DF design.

The very real advantages of inversion and of the salient-pole exciting winding can be seen from the table. The considerable reduction in the exciting winding power loss demonstrates the truth of the claims made (a) for the excitation efficiency of the concentrated winding and (b) for inversion. The reduction in total loss points to the further efficiency gains attributable to inversion; in addition to iron loss reductions there are reductions in windage losses due

** It can in any case be made exceptionally good for special applications by using semi-closed slots, a graded air-gap, a fractional number of slots p.p.p.p. and a chorded armature winding, and by skewing the armature slots.*

RATIOS OF SP RA TO RF DF QUANTITIES

Quantities	Ratio
Full-load exciter outputs	0·38
Total full-load losses	0·76
Armature D^2L products	0·67
Total copper weights	0·80
Total iron weights*	0·90

* The constructional differences make the iron weight comparison difficult. The weight for the RF DF machine includes the stator and rotor laminations and a length of the mechanical frame equal to the core length; for the SP RA machine the armature laminations, the poles, and the whole of the yoke, are included.

to the smaller fans permitted by the lower total losses. The increased loadings possible with the preferred construction are reflected in the armature D^2L products ratio. Finally, the reductions in the quantities of copper and iron contribute directly to the reduced manufacturing cost of the SP RA machine.

Costs

It is impossible to be precise about the manufacturing costs of these machines, since so much will in practice depend upon the quantities in production, the class of labour available, the place occupied by the machines in the overall production plan, and so on. Due allowances must be made for the cost of the additional slip-rings and brush-gear and of the additional damping winding on the one hand, and for the compensatory differences in the size and cost of the exciters and the cheaper yoke and pole materials of the SP RA machine on the other hand; the author considers, however, that the total cost of manufacture for the preferred construction should not, even in unfavourable circumstances, exceed 75-80% of that of the heavier and less efficient alternative.

Outputs and Speeds

It is also difficult to be precise as to the outputs and speeds at which the advantages of inversion are retained. The author suggests that inversion is both practicable and desirable for 50 c/s outputs of up to about 150 kVA at 1,500 r.p.m., and that for the standard 415 V 3-phase output an upper limit of about 180 kVA is perfectly feasible. Six-pole machines are equally satisfactory in frames up to those corresponding to the 4-pole limit; a maximum 1,000 r.p.m. output of about 150 kVA at 415 V follows. With 8-pole machines, however, the position is rather different; there is a substantial demand for 4-pole machines of as little as 5-10 kVA and for 6-pole machines as small as of 15-25 kVA, but it is doubtful whether the demand justifies the production of 8-pole machines of less than 40-50 kVA except in special circumstances (such as a large single order).

For outputs below this lower 8-pole limit, and in any event for even slower machines, the distributed-field machine may well be the most convenient, especially if a range of inverted synchronous induction motors is in production or if standard induction motor stampings are available.

Acknowledgments.—The author's thanks are due to Messrs. Crompton Parkinson, Ltd., for the use of Figs. 3a, 3b, and 5, and to Messrs. Bruce Peebles and Co., Ltd., for the use of Fig. 2 and for permission to publish this article.

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[4] Ibid., page 297.

RESEARCH AND THE LAMP

MANY outstanding contributions made to scientific and technological development by research workers in the electric lamp industry were described by Dr. J. N. Aldington last week in a lecture "Research and the Lamp" which he delivered in Liverpool. The occasion was a meeting organised by the Merseyside Electric Lighting Services Committee, and amongst the audience were the Lord Mayor and other dignitaries, as well as some 500 sixth formers from local schools.

Dr. Aldington, who made extensive use of demonstrations to illustrate his points, began with a consideration of the way in which glass became electrically conducting at high temperatures. The glass technologists in the electric lamp industry had, he said, made a major contribution to the development of glasses of the Pyrex type. Another field where many major advances were traceable to the work of lamp firms was metallurgy. This applied particularly to the methods of working such comparatively rare and refractory metals as molybdenum and tungsten.

The third scientific field where lamp activity had been notable was chemistry. Here the inert gases of the atmosphere had interested the industry for a long time, and now the phosphors used in fluorescent lamps were entailing much chemical research work to enable special requirements as to colour and other characteristics to be met.

Our readers' views . . .

Cultivating Overseas Markets

DO British engineers at home appreciate their responsibility as well as their opportunities in the field of commonwealth relations and developments?

Our manufacturers know that competition is increasing in the overseas markets, that times are changing and that engineers in commonwealth countries are not content merely to follow the lead of the home country. A more active policy is needed, firstly to study the needs and problems of those countries so as to supply them with what they want and at the right time, and secondly to keep their engineers in touch with the latest achievements and problems at home and the technique or "know how" which has maintained the reputation of British engineering so well in the past. Particularly is this so in Canada, where the proximity of the United States and the pressure of American investment exert such a dominating influence.

I am sure that this situation merits the earnest attention of all engineers and vigorous and concerted action through such organisations as the I.E.E., the B.E.A. and the A.C.E., as well as B.E.A.M.A. and the C.M.A.

May I commend this to the Technical Press as a worthy crusade. The Coronation period offers a unique opportunity for stirring up interest in the great developments in progress or projected throughout the Commonwealth in which the home country can and should make her contribution.

LONDON, S.E.1 *D. P. Sayers*

Suppression and Performance

IN reply to your correspondents Messrs. J. F. Stanley and H. J. Long, whose letters were published in your issue of January 29, the salient features of the engine concerned are as follows. Six cylinders in line, 78 by 90 mm., 2,580 cc., twin overhead camshafts, compression ratio 6·5 to 1, output 105 b.h.p. at 5,000 r.p.m. (although due to age and wear this figure is probably somewhat less).

It is probably true, as your correspondents pointed out, that this design (which, incidentally, uses 10 mm. plugs with a certain amount of water cooling) is not representative of the general run of engines, but with the comparatively low compression ratio it might be expected that the effects of including a suppressor would be rather more marked than in the normal engine.

From letters recently published in the motoring journals it would appear that the improvement at starting is due to the fact that the less violent spark, which due to the damping effect of the suppressor has a much reduced peak amperage, causes less local disturbance of the suspended particles of petrol in the mixture and thereby initiates easier combustion. This reduced peak amperage also allows the points to run cooler with normal running and thus avoids point burning. Of course, only bench testing could give an accurate idea of true performance.

LONDON, W.C.1 *E. Bartlett*

Off-Peak Tariff for S.W. Scotland

THE introduction of reduced rates for restricted-hour and off-peak supplies is announced by the South West Scotland Electricity Board, along with intimation of an increase in the domestic and farm tariffs. Both are to operate from March 2 next. Under the restricted hour tariff, there will be a unit charge of 0·755d for l.v. supplies or 0.73d for supplies metered at 6 kV or over, together with a coal price adjustment clause. These cheap rates will apply to supplies taken only during the night or at week-ends or during the daytime between noon and 3 p.m. This new tariff will interest commercial and industrial consumers taking supply under the Board's block commercial and industrial tariffs.

In regard to the increase in the domestic and farm tariffs, the adjustments involve in the case of domestic tariffs, increasing the primary rate from 4d to 4½d p.u. (3½d to 4d in Glasgow and Rutherglen) for credit meter supplies and raising the number of primary units from 13 to 15 per room p.q. The prepayment primary rate of 6d p.u. is unchanged. In the case of the farm tariff the changes are similar. The secondary unit charge is unaltered. The Board emphasises that all tariffs are to be reviewed at March 31 next. We also have news of increases in tariffs from the South Eastern Board, which are noted on page 270.

Wind Generation for North Wales

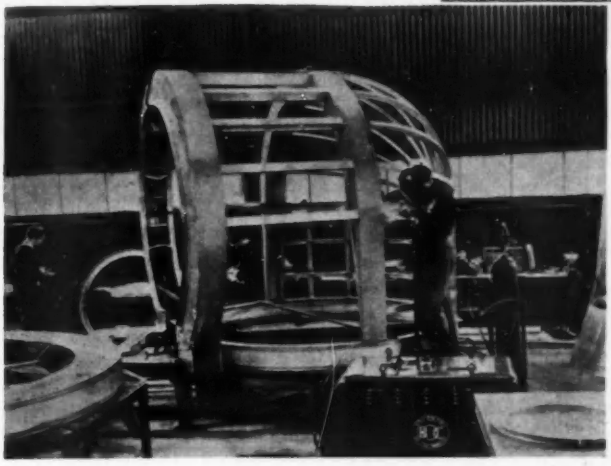
INLAND TESTS PLANNED FOR NEW MACHINE

PRELIMINARY trials are expected to take place this summer of the 100 kW wind-driven generator which the B.E.A. has ordered from Enfield Cables Ltd. The machine, which has a propeller sweeping an 80 ft. diameter circle, is now being completed at the works of the principal sub-contractors, de Havilland Propellers Ltd., and the English Electric Co. Ltd.

As has been announced previously this Enfield machine, which is intended for erection in North Wales, operates on the "Andreau" or "depression" principle. The propeller blades are hollow, and have openings near the tips. When the propeller rotates, the pressure inside it is reduced below atmospheric. A wind turbine is mounted at the foot of the 100 ft. high hollow tower which supports the propeller and air is drawn through this by virtue of the pressure difference set up by the propeller. The axial flow turbine can handle 50,000 cu. ft. (1¾ tons) of air per minute.

Electrical energy is generated in a 100 kW, 415 V. 3-phase synchronous induction generator, which is started from rest as an induction motor. Wind speeds of 30 m.p.h. and more should give full output. When wind speed reaches 65 m.p.h., the plant will shut down.

Present plans provide for erection near Enfield for trials under light inland breezes. While this work is progressing, an exhibition entitled: "Energy from the Wind" will be held on the testing site. Later the plant will be dismantled and taken by road to North Wales for erection on the permanent site.



Above is seen the inboard section of the propeller constructed at the de Havilland Works, Hatfield. On the left is a welder at work on the aluminium alloy structure enclosing the feathering mechanism and main bearings

TRENDS IN TAXATION

Desirable changes discussed in E.C.A. Dinner Speeches

IN view of the falling-off in the demand for electricity, there is the clearest justification for the removal of purchase tax applied to current-consuming devices within the last few years. This point of view was forcibly stated by Mr. W. T. Trace, president of the Electrical Contractor's Association, at the Association's annual dinner last week.

Mr. Trace had stressed the willingness of electrical contractors to play their part in any constructive efforts to return to industrial prosperity as the solid foundation of the country's standard of living. He felt that many British industries were suffering from the lack of a stable home market, and called for more Government economies and fewer trade union restrictive practices. This could lead to the Chancellor of the Exchequer in his next budget granting reliefs from taxation which would make a serious contribution towards the revival of home trade.

An associated topic was the situation which arose following any fall in the rate of purchase tax. The loss to the retailer was manifestly unfair, and fair play demanded that there should be a full assurance on this matter and an equitable basis upon which refunds will be made should be established at the earliest possible moment.

Cooking and Heating

Other topics covered in the president's closely attended speech included anti-electric propaganda and the falling-off of the cooker load. With regard to the first he put it strongly that no one dreamed that one of the objects of nationalisation of the fuel industries was to restrict the freedom of the individual. Contractors asked only that within the bounds of national policy, the public should be free to determine the fuel which was most economic and suitable for their reasonable needs and comfort.

Electric cooking provided a field for national action, and the E.C.A. hoped to have joint discussions with the B.E.A. on this subject at an early date.

Taxation had been the main theme of the principal guest of the evening, the Rt. Hon. Lord Balfour of Inchrye. In proposing the toast, "The Allied Associations," he had suggested that if Great Britain were to win the competitive trade battle for world export markets, then the greatest possible competitive power had to be obtained from technical skill, labour and plant. Britain was pledged to support a policy aimed at the revival of world multi-lateral trade with consequent low protection. The greatest weakness in the country's ability to forward this policy lay in the grave weakness in plant and machinery, which had been brought about by the incessant demands of past and present taxation policies.

A Tax Holiday

It was impossible at present taxation levels for management to put aside enough to replace machinery at existing prices. A useful suggestion might be for employers and unions to agree jointly to lift the question out of the arena of party politics. If the two parties made strong representations to the Government some action would have to be taken. One possibility would be to consider giving a tax holiday of limited duration for monies put aside as reserves, to be used strictly and only for the purposes of plant renewal. Organised labour could give support to such a scheme because it would safeguard directly the jobs of the men in their industries.

After the main speeches, the six hundred and more present at this impressive gathering, heard Mr. S. L. M. Barlow (vice-president), propose the toast of the guests in a wittily composed speech. The first response came from Mr. Howard Robertson (president, R.I.B.A.), who spoke of the confidence architects were able to repose in members of the E.C.A. There was work for all sections of the building industry, and he hoped that all would stick to their own parts. He finished by remarking that he was all for nationalised power, but "heaven forbid that we should have nationalised contracting."

The other speaker was Col. C. Banks, M.P., who described himself as "half of a pair." The serious pith of an amusing speech which he delivered was concerned with the development of trade with the people of S.E. Asia. Nearly half the people of the world were underfed, and they provided the sort of market which our greatg-randfathers went out to capture.

Taking these views alternately left and right, from the top of the page, 1. Mr. L. C. Penwill, talks with Col. C. Banks, M.P., one of the speakers, and Mr. P. G. Wallace. 2. Messrs. W. E. Hind, J. R. Haliwell (Vice-President) and E. A. Reynolds foregather prior to the dinner. 3. Mr. L. C. Penwill, Director and Secretary of the E.C.A., consults with the President, Mr. W. T. Trace. 4. Mr. J. R. Soans chats with Dame Caroline Haslett (B.E.A.) and Mr. V. Dale (E.D.A.). 5. Principal guest of the evening, Lord Balfour of Inchrye, is seen here with past-presidents P. G. Wallace, R. H. M. Drake, and S. N. Watkins. 6. In this group are Messrs. J. Smellie (Secretary, E.C.A. of Scotland), H. A. Knox (Chairman, British Synchronous Clock Conference), F. C. Vine (Secretary, Accumulator Manufacturers' Association) and A. S. Lowe (Secretary, Fair Trading Council)

NOTES ON WIRING *by Megohm*

Problems for Installation Engineers

IN comparison with manufacturing processes where the programme for production is carefully planned, reasonable access to materials and labour is available and manufacture carried out under a common roof, the contracting industry has many more difficult problems to negotiate and overcome in carrying out contracts on site. Today these problems tend to increase since it is becoming the practice of large organisations to make the contractor, where possible, shoulder the major risks.

For example it is now common practice for many large undertakings to purchase direct from manufacturers the major components of an electrical installation, such as main switchboards, main cables, lighting equipment and lamps leaving the electrical contractor to supply conduits, v.r.i. cables and wiring accessories and to provide working drawings, labour and supervision.

If it is not well known it should be, that in the preparation of an estimate for works on site the unknown quantity and main risk lies in the labour content and in removing the safe content, i.e. supply of switchboards, main cables, etc., which generally forms a substantial proportion of the total value of the work, the contractor is left holding the baby. To protect his interests the wise contractor must provide for every contingency in carrying out such contracts where the bulk of the materials are supplied to him to erect and connect, otherwise he may very easily find himself in Queer Street.

I believe it is the practice of petroleum groups to place orders direct with manufacturers for flameproof switchboards, equipment and cables, etc., and in certain cases all the electrical contractor is called upon to provide is labour and supervision on a schedule rate basis which some contractors, I am told have found to their cost not to be a satisfactory arrangement.

Inquiries

In connection with inquiries sent out for small lump sum tenders, I hear complaints about the unnecessary sub-division and filling of up schedules. For example, a 20-page specification including schedules has been drawn up to cover an inquiry for a contract that obviously could not exceed £400-£500 in value. Costs in this tender had to be sub-divided thus :

(*a*) Prime cost given for the supply of each type of lighting fitting, low-voltage transformer, switch, switch socket and distribution board and the percentage to cover overheads and profits shown as a separate item.

(*b*) Costs for the supply of conduit, conduit fittings, v.r.i. cables, etc., including overheads and profit.

(*c*) Costs for the erection of items covered by (*a*) and (*b*) above including overheads, etc.

Standard Agreements

For time and material rates, over a page is devoted to what would appear to be unnecessary detail. It would surely be preferable to state that for time and material rates the contractor would be paid under the national schedule of daywork charges as agreed between the representatives of the Chartered Surveyors Institution and the National Federated Electrical Association with the addition that if the contractors objected to the percentages given in this schedule they could make an offer increasing or decreasing the percentages.

With reference to variation in costs arising on materials and labour, the contractor is advised that the supplementary clause in the model form of General Conditions of Contract (1948 edition) recommended by the I.M.E. and the I.E.E. for use with home contracts subject to any further agreed arrangement between the B.E.A. and Area Boards on the one hand and the B.E.A.M.A. on the other hand would be enforced.

On another contract for the supply and laying of cables, variations in costs arising for supply and installation are recoverable in a different way. Here the contractor has to declare the basic price of electrolytic copper, lead and wire and tape armouring at the date of tender and give rates for 1,000-yd lengths of cable for each type specified showing the variation that would arise for each £1 per ton rise or fall in the basic prices.

The several methods now in circulation for calculating increases or decreases in costs of material and labour give rise to concern and it is about time a simple, standard method was agreed and adopted to arrive at the value of variations in cost of material and labour.

Diesels for Power

MIRRLEES BUILD RANGE OF MEDIUM GENERATOR DIESELS

OPPORTUNITY was taken last week of an invitation to view the Hazel Grove Works of Mirrlees, Bickerton and Day, Ltd., Stockport, Cheshire. The firm, it will be remembered by some of our older readers, has a long and honourable history in the field of Diesel engine manufacture, going back as far as 1897 when the first Diesel ever to be built in the British Empire was constructed by Mirrlees at Glasgow.

Modern requirements and the rationalisation of production within the Brush-ABOE Group have resulted in a policy of restricted range of the various individual firms. In this policy, Mirrlees now build two ranges of engine using two cylinder sizes, both in line and vee-form, allowing a power range of 135 to 3,000 b.h.p. This company is now consolidating on these two ranges following considerable expansion which began in 1946 and reached its peak last year. The order book is being restricted for the next two years to £6m./year, after which the position will be reviewed.

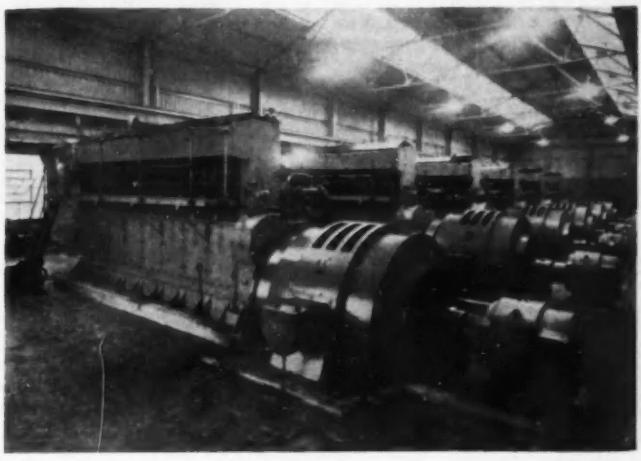
This information was given by Mr. C. F. Barnard, director and general manager of the company, outlining the present situation. Commenting on the two types of engine, "J" and "K" types, it was pointed out that in the former considerable attention had been given to versatility. It had been designed to incorporate individual characteristics of single-purpose engines, so that it should undertake equally well the widely different functions of marine propulsion or electric power generation.

In the electrical field, the Diesel unit is far from being out-dated and one of the more important stations put into service since the war is the Peel generating station, Isle of Man, which comprises seven "HFS.8" units to which two "KVSS.12" units will shortly be added, to give an output of 10,500 kW. Smaller installations are those at Selfridges, London, with three "TL.8" engines to give 750 kW as standby plant, the 420 b.h.p. unit with waste heat recovery at Pasolds, Ltd., Langly, and a similar unit at Hope Mills, Darwen.

The Factory

The Hazel Grove factory is particularly well equipped to cope with the demands for Diesel plant for land and marine use, and is laid out to take full advantage of flow production techniques. In fact, one of the advantages of restricting the annual work undertaken has been to permit re-tooling to take place on a rational basis.

Semi-standardisation of design has permitted the introduction of specialised machine tools on a sound economic basis where considered necessary. Among the large quantity of modern equipment installed are four "Plano" milling machines, which reduce the operating time to one-half that required by the old standard millers; an Asquith double head angle borer—for line bores—which can operate both on in-line or vee-type cylinder blocks and can bore the main liner housings at an all-in average rate of 90 minutes per cylinder; an Alfing



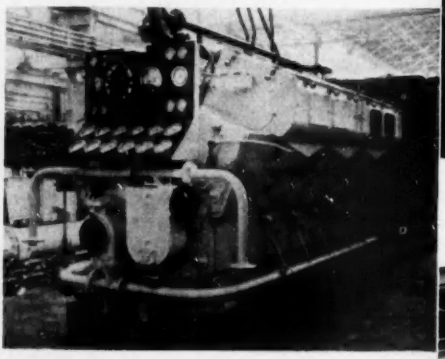
Mirrlees Diesel generating set, in Peel (I.O.M.) power station

bedplate borer, which, due to its high accuracy, saves a considerable amount of time in the fitting and erection shops; and a Fischer profile turning lathe for the machining of through bolts for the "K" engine. This machine is claimed to take one-quarter of the time to make these bolts than that of ordinary lathes.

Materials handling has received special attention. All bays, with one exception, have overhead cranes, and as far as possible all static equipment is kept between stanchions out of the cranage areas. Electrically operated jib cranes are fitted throughout the works to facilitate the production flow, and battery-driven band and fork trucks are used wherever possible. Extensive use is also made of pneumatic tools, cranes and hoists.

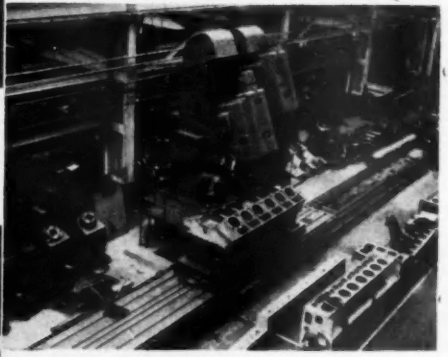
A power-house, equipped with two Mirrlees Diesel engines, a "TV.12" 12-cylinder vee-formation engine and one "JS.6" six-cylinder in-line turbo-charged engine, each rated at 750 b.h.p. at 600 r.p.m. and producing 900 kW provides a large proportion of the works' needs.

An interesting development recorded in the home market for the large Diesel engine is the increased demand for private generating plant by the textile industry. As all textile mills require low-pressure steam or hot-feed water, full use can be made of all exhaust heat through the medium of an exhaust heat boiler. In fact, some mills already fitted with the plant claim an overall efficiency of over 80%. A special "Textile Power Division" has now been established to concentrate on this particular industry.



Above, a type JV.12 engine in the shipping bay. This is a characteristic example of the vee form of the J type engine

Above, can be seen the Alfing bed-plate borer. The bed is mounted on the machine tool, the boring shaft traversing its entire length



Above, the Asquith cylinder block borer. Its head is inclined at an angle of 22½° for the vee casing, inline casings being tilted appropriately. Left, the Fischer profile lathe, on which the through bolts for the K cylinder are turned

Current-Chopping in Circuit-Breakers

RECENT RESEARCHES DESCRIBED AT I.E.E.

THE phenomenon of current-chopping in the operation of circuit-breakers is responsible for high overvoltages particularly when a lightly-loaded inductive circuit is being broken. In consequence, insulation levels may need to be greater than would be expected for normal service, and, as this in turn leads to added costs, particular attention has been paid to analysing this phenomenon. Some of the research work recently carried out was described by Mr. A. F. B. YOUNG (A. Reyrolle and Co. Ltd.) in an I.E.E. Paper "Some Researches on Current Chopping in High-Voltage Circuit-Breakers," presented to the Supply Section last Wednesday.

Arc Extinction

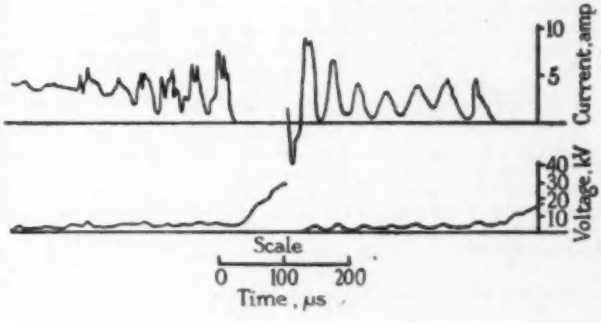
He began by giving details of mechanism of arc extinction. It was well known that an arc consisted of a volume of gas between electrodes, which was maintained at a high temperature by the passage of current through it. The maintenance of the high temperature was essential to high conductivity, and small temperature changes could produce large differences in the conductivity. Power was lost from the arc as heat flow, and was made good from the source or from the thermal capacity of the arc itself.

With slow changes of arc-current, the thermal capacity had little effect, but with cyclic current changed, this thermal capacity became of importance and tended to hold the arc conductivity higher than would be experienced in the steady state conductivity. As a result, an arc in an a.c. circuit-breaker had a finite conductivity at current zero, but as near current zero the power input to the arc was small, the loss was still fairly large and the arc conductivity was therefore dropping rapidly. If it had been reduced sufficiently during the period near current zero, the amount of power that could be fed into the arc after current zero might be so small that the losses could not be supplied and the arc was extinguished. This was known as "thermal clearance" and it was suggested by the author that it was the basic process of arc extinction in all circuit-breakers, although it was not necessarily the only requirement for successful clearance.

Air-Break and Air-Blast

In an air-break circuit-breaker, arc extinction was almost entirely due to thermal clearance, and oscillographs showed that the arc resistance at current zero was quite low, and there was appreciable conduction after the current zero, even for an easy clearance. This was typical of air-break circuit-breakers, but was not necessarily so for other types.

In air-blast breakers, both the thermal process, and a dielectric process were probably involved. Before final clearance could take place, the arc had to be extinguished and the contact gap conditioned to withstand the restriking voltage. The effect of the blast was to increase the heat dissipation from the arc with the result that thermal clearance and increase in voltage might occur more or less at the same time. Under normal conditions, however, thermal clearance might take place before the arc-voltage zero, and therefore before the onset of the restriking voltage transient, and although the arc voltage increased only slightly near current zero, the rate of increase might be very large and might cause current to



Oscillogram showing current-chopping by an air-blast circuit-breaker for an r.m.s. current of 9·3 amperes

be diverted into the system capacitance shunting the circuit-breaker, thus bringing the current through the circuit-breaker to zero prematurely. This facilitated thermal clearance, but created a further period following arc extinction before the full value of the restriking voltage appeared across the contacts. The premature suppression of the arc current by diversion into shunt capacitance (which was inevitably present) was the basic form of current-chopping.

In practice, the process was complicated by sudden drops in arc resistance, which set up oscillations between the shunting capacitance and inductance and the circuit breaker arc, and in turn gave rise to violent oscillations of the arc current. In some cases, these oscillations were large enough to bring the current to zero and to allow of very early extinction. This also was known as current-chopping.

Voltage Recovery

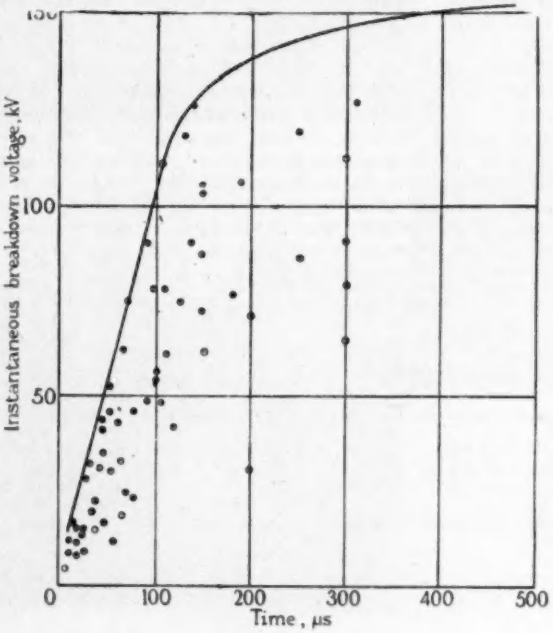
When current-chopping took place, voltage transients were produced across the current-controlling reactance and also across the circuit-breaker contacts. Since the maximum value of transient voltage was frequently determined by the breakdown of the contact gap, the breakdown voltage of the gap, immediately after chopping had been studied for a particular type of breaker. A graph of variation of gap-breakdown voltage with time after current-chopping for this air-blast breaker showed that in the lower ranges a fairly well defined relationship existed, but the upper part had not been so well explored, but an approximate peak value of about 150 kV existed. The author then derived a theoretical basis for evaluating the voltage produced by chopping taking into account eddy current and hysteresis losses. This theory, however, gave values of the prospective rise in voltage; in practice a limiting value of this was imposed by the gap-breakdown voltage curve.

Oil Circuit-Breakers

The main difference between air-blast and oil-break circuit-breakers as far as chopping was concerned lay in the different contact-gap breakdown strength characteristics in relation to time from contact separation. The initial rate of gap recovery for an o.c.b. was very high (5,000 V per microsec) even when the currents were very small. The mechanism of current-chopping was, however, substantially the same for both types. When the contact gap was small, the prospective voltage was very much greater than the gap-breakdown strength and restrikes might occur in quick succession. Again, a theoretical analysis was included.

The final section of the paper was concerned with the application of the general discussion (which used single-phase circuits) to various three-phase cases, and some recent transformer-switching test figures were given. In the conclusions it was pointed out, *inter alia*, that the switching of shunt reactors produced higher voltages than the switching of transformers in both types of breakers, but by using a low-voltage resistor, connected across a tapping on the reactor during switching, by an auxiliary switch, which closed as the circuit-breaker opened, the reactor could be damped and the voltage, produced by switching, lowered.

The use of switching resistors of the kind suitable for control of r.r.r.v. could have little effect on the transient voltages due to current-chopping by air-blast breakers, but could produce significant reduction in voltages with the larger r.m.s. currents



Variation of gap-breakdown voltage with time after chopping for an air-blast circuit-breaker

which were usual with oil circuit-breakers.

Wherever possible, circuit-breakers should be tested in a three-phase circuit for their ability to interrupt small inductive currents, and care must be taken to represent the capacitance and losses of the circuit adequately.

DISCUSSION

MR. D. P. SAYERS (B.E.A.) said that the paper brought out the difficulty of reproducing service conditions at the test plant. The most conclusive indication of performance would be obtained by site testing, and the B.E.A. were prepared to collaborate with manufacturers by providing facilities for large-scale switchgear testing on the Grid system, and a scheme might be developed of mutual benefit to manufacturer and user.

On the controversial issue of resistance switching the B.E.A. had a ringside seat, but had occasionally to do a little refereeing. It seemed that a high-speed 132-kV circuit-breaker, not incorporating resistance switching, could under certain conditions produce overvoltages of 400 to 500 kV. Occasional 450-kV switching surges might be permissible on transformers having a 550-kV impulse level, but the older transformers had no definite impulse level and surges of this kind might represent a considerable risk.

The conventional circuit-breaker did not clear the fault until the current had risen to 10 to 30 times the normal load current of the circuit, and the whole system had to be designed to stand up to the short-circuit stresses which might occur. What was wanted was an electronic circuit-breaker which would first act as a brake to prevent the current rising to these great values and then interrupt it with little stress to the system.

MR. T. W. WILCOX (Merz and McLellan) suggested that if internally generated transient overvoltages could be abolished it would, in certain cases, almost halve the cost of a cable system. Switching overvoltages were the worst offenders. It had been demonstrated that the transient overvoltage due to switching heavy currents could be eliminated by the use of resistors of comparatively low ohmic value shunted across the break, but this did not succeed in preventing the 50 c/s voltage to ground from rising to 1·5 times the normal phase value in certain circumstances or in eliminating transient overvoltages resulting from the interruption of small currents. These difficulties might be overcome if during any switching operation both sides of the breaker could be tied down to earth by means of two resistors, one on each side of the breaker.

MR. C. H. FLURSCHEIM (Metro-Vick) said that no one had thought of a way to stop current-chopping. The author suggested that the dielectric strength of the interruptors might be used to limit the voltage, but if the interruptor alone were relied on it would appear that the dielectric breakdown of the gaps must be undesirably reduced. To slow down the contacts also seemed undesirable. A third possibility was to put resistance damping on the breaker, and this did not impair the voltage limit of the breaker.

MR. J. M. FERGUSON (E.E.) suggested that three attitudes might be adopted towards overvoltages produced by current-chopping of inductive currents. One was to consider only the magnetising currents of transformers and to say that dangerous currents were not produced. The author's own results showed that there was no substance in this contention. Another was to say that overvoltages would occur at rare intervals and that the protection of the system must take care of them, and this was open to objection. The third was to let the breaker protect itself and fit a resistor across the contacts.

DR. J. R. MORTLOCK (B.T.H.) complimented the author on the physical interpretation of a very complex phenomenon and subjected the paper, by means of lantern slides, to considerable criticism on points of detail.

MR. H. F. MAAS (Ferguson Pailin) congratulated the author on bringing out so clearly the interaction between the circuit-breaker and the circuit and expressed the hope that this would lead to the disappearance of the notion that the circuit-breaker alone was responsible for the overvoltages on current-chopping.

DR. R. WILLHEIM (consulting engineer) contributed a few notes on the history of the problem.

MR. E. L. WHITE (E.R.A.) said that there were features of the multiple current-chopping phenomenon which were not brought out in the paper but which might have an important influence on the voltages set up in windings. At the first restrike a steep-fronted impulse was applied to the winding which would set up an internal complex oscillation. One effect was that the incidence of current-chopping might be influenced by the fact that the magnetising current now had superposed on it a h.f. transient oscillation, while the restriking voltage might also have a transient oscillation superposed on it. It was thus possible for synchronisation to occur between the current-chopping phenomenon and the natural oscillation of the circuit.

MR. A. ROXBURGH (B.T.H.) remarked that the paper came at an opportune moment, because designers were engaged in producing circuit-breakers for 200- and even 400-kV systems, and there was general agreement that where these h.v. systems were effectively earthed the apparatus to be used on the system could be designed with a lower margin between the insulation level and the normal operating level than was usual with apparatus up to 132 kV.

DR. W. B. WHITNEY (E.R.A.) mentioned that the E.R.A. were about to publish the results of some measurements on 132-kV transformers in situ. Of nine measured, seven had an equivalent lumped capacitance per phase of about 0·001 μF.

MR. L. CSUROS (B.E.A.) put forward considerations to indicate that test plant conditions might reduce the tendency of the breaker to chop and also the maximum value of overvoltage appearing on the transformer.

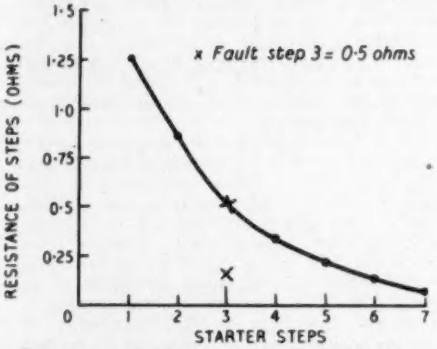
The Author replied briefly to the points raised.

PROBLEMS AND PRACTICE in Engineering

Resistance Units—Motor Starters

THE resistance units of motor starters occasionally fail due to open circuits or burn-outs, and to avoid a prolonged stoppage should no spare starter be available, the fitting of a temporary external resistance of suitable value and size to the starter may be the means of putting the plant back into service whilst a new section of resistance is obtained.

In many cases it may be possible to find the approximate value of the faulty units by



Plot of starter resistor valves to locate faulty step

measuring those of the sound sections and plotting them against a base of the total number of starter steps, from which a curve can be drawn. The vertical intersection of the curve taken from the particular faulty step will then show the value of resistance required.—*T. H. Snelson.*

Cooker Shocks

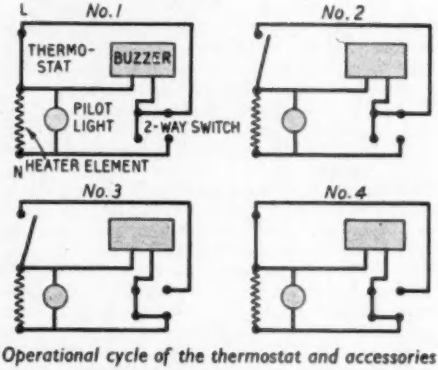
SOME time ago I received a complaint from a person who had received shocks from an electric cooker. On investigation the cooker appeared to be in a satisfactory state, the insulation resistance was high and the earth connection found to be in good order.

I was about to put the job down to an intermittent fault but decided to try to find out more about how the shocks were received. After a great deal of thought I found that the shocks were received on only one occasion (the original report said many times) and this "might" have occurred when the person concerned had been getting a light simply by applying a piece of paper to the glowing griller element.

After a short search the discarded "paper" was located and found to be from a cigarette packet—a piece of very thin paper backed by very fine tinfoil—hence the shock via the conducting foil. The folly of such action was quickly pointed out to the individual concerned, but it illustrates the liberties taken by some users of electricity.—*K. W.*

Buzzer Warning

HAVING from time to time to test various immersion heaters for efficiency, it was necessary to take readings such as current consumption, temperature, etc., as and when the thermostat cut out or in. A pilot lamp connected across the heater element gave, of course, visible indication only, and watching this proved to be too great a mental strain. Under this urge the following arrangement was put into operation, giving audible warning with completely satisfactory results.



Operational cycle of the thermostat and accessories

From the diagram above, the operations are in the following stages:—

No. 1. Water cold, heater connected; pilot lamp lit and buzzer silent. First readings taken.

No. 2. Water hot, thermostat tripped open; pilot lamp out and buzzer operating. Reverse 2-way switch to obtain condition of next stage.

No. 3. Buzzer silent, second readings taken.

No. 4. Water cooled, thermostat tripped in; pilot lamp on, buzzer operating. Reset 2-way switch to silence buzzer, to bring conditions back to those of stage 1.—*W. B.*

Orders and Output—1952

THE GENERAL ELECTRIC CO. LTD.

IN the heavy electrical field, some 240 MW of turbo-alternators have been ordered during 1952 for the British Electricity Authority. Three 60 MW hydrogen-cooled sets are on order, two for Hams Hall "C" and one for the station at Ince. This will bring the number of sets at these stations up to five and four respectively. In all, fifteen 60 MW hydrogen-cooled sets are in hand, one of which has been commissioned at Uskmouth, Newport, Mon, where six are to be installed.

Two 30 MW sets for Barony power station, South-West Scotland Division, will be the first to be erected for pit-head generation using low grade coal. At Huncoat, an interesting system of boiler control is being used with the two 30 MW G.E.C. sets. The boiler-house auxiliaries are used in conjunction with grid-controlled mercury arc rectifiers so that the boiler output automatically balances the electrical load, yet air and fuel ratios are maintained so as to give full combustion efficiencies.

Abroad, three 30 MW turbo-alternators have been ordered for the new Kelvin power station at Johannesburg, which brings the G.E.C. total for this municipality up to 547·5 MW. A 60 MW set has been ordered for Wilge power station, Transvaal, for supplying power to the Rand gold mines, and also to aid in the recovery of uranium. At Haifa, the second 30 MW set of the Palestine Electric Corporation has been commissioned, and in Eire two 20 MW sets are now running in the new peat-burning station at Allenwood. In India, two 10 MW sets and one 2 MW geared set for the Kalyan power station and the Government of Orissa Cuttack Thermal Scheme respectively, are in operation.

Hydro Plant

In the hydro field, the Norwegian State Power Co. has placed a contract for a 50 MW, 12·3 kV, 428·6 r.p.m. horizontal-shaft alternator for Pelton wheel drive for use in the new aluminium plant at Suundalsora. It will be one of the largest hydro-electric sets in Europe and the alternator weighing over 310 tons is specially designed to be shipped in sections. From Tasmania, an order has been received for the fifth 25 MW alternator for Tungatinah.

Contracts in hand for the B.E.A. include five 45 MVA transformers with voltage ratios of 132/66 kV and 132/33 kV as well as three 72 MVA generator-transformers for Hams Hall "C," two of 36 MVA for Doncaster, and two of 40·5 MVA for Huncoat. Thirty 1·5 MVA. transformers with Class "A" insulation throughout and arranged for natural cooling are in hand for the Ministry of Supply. Many distribution and rectifier transformers are also in hand.

At Oldbury an extensible type substation is being built, and for the first part three 132 kV, 2,500 MVA oil circuit breakers, isolators and earthing switches as well as two 45 MVA transformers are being installed. The most outstanding development in outdoor switchgear is the production of new 275 kV isolators and earthing switches. The former are rated at 1,200 amp, the three phases being ganged together and operated hydraulically, with provision for emergency manual operation. Both the isolators and the earthing switch will carry through short circuits with equivalent ratings up to and including 7,500 MVA.

Metal-clad Switchgear

Metalclad switchgear includes a large amount of 33 kV heavy duty plant. Thirty 750 MVA units are commissioned or being erected for the London and Midlands Electricity Boards and forty-one 1,000 MVA units for service in Australia. Twelve of the latter are to go in at Pyrmont "B," Sydney, where a 28-unit board of this type and rating has been in operation for several years.

The first six of fourteen 11 kV, 1,000 MVA double busbar units for the new Nechells power station, Birmingham, are installed. Busbar selection is by means of motor-operated oil-immersed switches arranged for both "on" and "off" load selection. A central gangway gives access both to the rear of the circuit breakers and to the voltage transformers.

Orders in hand include a 10-panel 11 kV, 750 MVA board for West Bank Station No. 2, South Africa, and a similar 9-panel board for the South African Iron and Steel Industrial Corporation, Ltd., where some 87 metal-clad units and three electrically-driven turbo-blowers are already in service. For the British Electricity Authority nine 33 kV, 750 MVA units are in hand in addition to 38 medium-duty units for 6·6 kV and 11 kV service in various substations.

The range of heavy duty switchgear has been extended to include non-phase-separated units

of ratings 22 kV and 33 kV and up to 1,000 MVA. The non-phase-separated unit has been developed for situations where the use of a simpler construction is justified. The main simplification is the enclosing of all phases of the busbar structure in a common housing with the reduction of overall dimensions.

Cable

Pirelli-General Cable Works has received an order from the Aluminium Company of Canada for the manufacture and installation of a 0·4 sq. in. single conductor, oil-filled cable and sealing ends to form a 750 yd termination for an overhead line operating at 301 kV, 3 phase, with centre point earthed. This is one of the highest voltages at which an industrial cable is at present operating anywhere in the world.

Facilities for the manufacture of co-axial cables have been increased. Three machines have been installed capable of producing 20,000 yd a week of copper conductor supported co-axially in a formed copper tube by means of spaced polythene discs which are formed by being punched from strip.

Rectifiers

Many large rectifier installations have been commissioned or are in hand. At Park Gate Iron and Steel Co., a 1,740 kW twin-cylinder grid-controlled system controls the 2,200 h.p. d.c. motors driving turbo-blowers. Another installation is operating at the Abbey Works of the Steel Company of Wales. Printing press drives are in hand for the Kemsley Press and a 1,100 kW equipment is in hand for Arthur Lee and Sons, Sheffield. Several smaller installations are also on order for steelworks use.

In railway electrification, a 1,500 kW rectifier is on order for the Victorian Railways, Melbourne, and two 1,200 kW mobile substations for the Netherland Railways will bring the total on this system up to nearly 29,000 kW.

Following the introduction of the single anode pumpless steel tank rectifier for providing a d.c. supply from 3-phase a.c. mains without the introduction of an intervening transformer, numbers of equipments are being supplied for Witton-James printing press drives.

Industrial Plant

At Trostre Tinplate Works, the two 2-stand mills, with each stand driven from a 1,000 h.p. motor, are now in commission, and at Abbey Works the coil skin pass mill and sheet skin pass mill are now in operation. The coil skin pass mill is driven by a 700 h.p. 500/1,000 r.p.m. motor and the latter by a 400 h.p. 0/500/1,000 r.p.m. motor supplied from a 330 kW grid-controlled rectifier.

Mining plant commissioned includes four 4,200 h.p. geared a.c. winders for a new mine near Odendaalsrus in the Orange Free State. These use the new system of dynamic braking and motor control in which constant torque is maintained at all speeds. The system has been further developed so that rope speed is directly related to the position of the operating lever, thus preserving the over-riding torque limit feature. This makes the performance of the a.c. winder very similar to that of the d.c. Ward-Leonard controlled plant. At home, the new system is being applied to geared a.c. winders for Afon and Cwm collieries of the National Coal Board in South Wales.

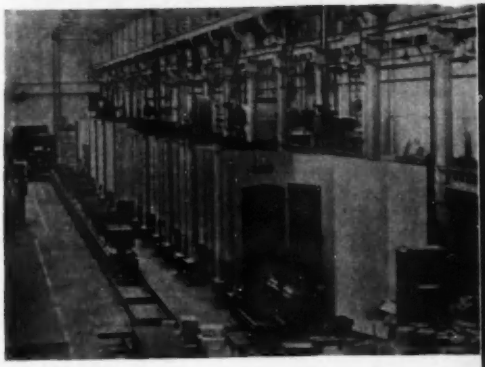
Other home orders are for two 3,700 d.c. winders for the Silverwood East and Cadeby Main collieries in the N.E. Division of the Coal Board. The d.c. supply in these cases is provided by a 2,650 kW Ward-Leonard set, driven by an 11 kV synchronous motor. Sixteen electric haulages are on order for the N.C.B., and auxiliary mining plant includes 67 portable substations for collieries throughout the country.

Heating equipment of all types continues in demand. High-frequency heating equipment includes a 25 kW edge-glueing machine which can handle panels measuring 80 in. by 40 in. by 2 in. at a rate of 20-30 per hour. In process heating, the sheathed wire element appears to hold equal importance with infra red lamps. A new range of water-boiling urns for catering establishments has been produced to cover 3-, 6- and 10-gallon sizes. In these examples the heating is by means of sheathed wire immersion elements with safety cut-out devices to prevent the elements against failure by boiling dry.

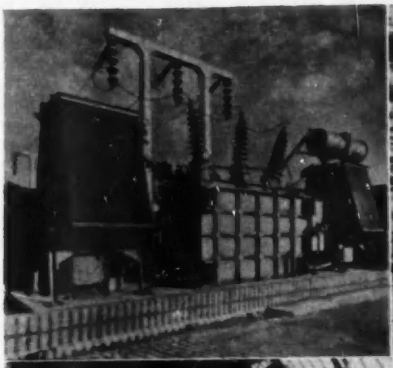
Lamps and Lighting

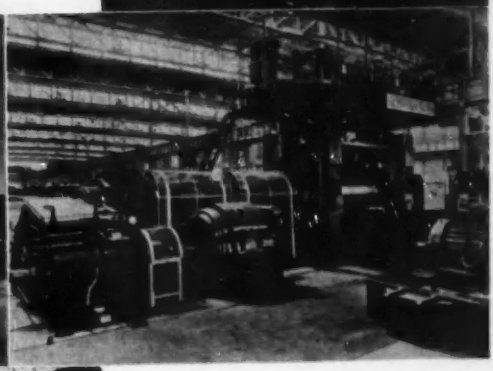
A new phosphor, with a deep red fluorescence, has been found which is particularly suitable for h.p.m.v. lamps and its incorporation provides excellent colour rendering. Many improvements have also taken place in auxiliary gear and special lamps.

A new type of sign for shop windows or counters is being marketed. It comprises letters of 6 mm glass tubing individually mounted on Bakelite holders with small built-in magnets by which they can be attached to an iron plate forming the background of the sign. The letters are thus easily interchangeable. The whole sign, including the power pack, is self-contained and ready for connection to any a.c. supply. Consumption is only about 100 watts.



Above is a kiln supplied for the Public Works Dept., Entebbe, Uganda. On right is an example of coal-face lighting in Birch Coppice Colliery





Above, on the left, is a 45 MVA 132/33 kV transformer installed in the Oldbury substation of the B.E.A. Immediately above can be seen the sheet skin pass mill at Abbey Works, Steel Co. of Wales, showing the 400 h.p., 0/500/1,000 r.p.m. mill motor in the foreground. Cable making is shown on the left. This plant at Pirelli General Cable Works is making coaxial cable

overseas news

Saskatchewan's Problem

The Fort a la Corne hydro-electric development is now likely to be delayed several years, according to Mr. J. W. Tomlinson, general manager of the Saskatchewan Power Corporation. This resulted from the rather unfavourable report of the Royal Commission on the South Saskatchewan scheme (see January 15 issue). Mr. Tomlinson added that controlled downstream water flow that would result from a South Saskatchewan river dam at Outlook, Sask., would increase the power production at Fort a la Corne, making the proposed downstream power location more economical to operate. The Fort a la Corne location is about 40 miles downstream from Prince Albert and is beyond the junction of the North and South Saskatchewan rivers. It has long been mooted as one of two major hydro power sites in Saskatchewan. The other is that proposed at Outlook.

Winnipeg Purchase

The sixth session of Manitoba's twenty-third legislature was prorogued recently after sanctioning government purchase of the electricity properties of the Winnipeg Electric Co. All that needs to be done now is pay off the company's shareholders. The money was voted for this purpose at the close of the session. Main feature of the modified purchase offer made by the Government is that the latter will not have to guarantee the principal and interest on the $27,600,000 bonded indebtedness of the company. The adjusted offer allows for sale of the transport and gas utilities (which are to be formed into separate corporations), but retains the $17,000,000-odd electrical retail distribution system under the mortgage. The modified offer does allow for the eventual sale of the distribution system, but only on condition that the proceeds be used to pay off the outstanding bonds.

Long E.H.T. Line

The 400 kV transmission line to run from the proposed Bersimis River project to Montreal, would, when completed, be the longest power transmission line of that capacity in the world, according to a statement of Mr. E. Gobier, of the Quebec hydro undertaking. He said the longest present distance in Canada is the 300-mile stretch from Beauharnois to Toronto. "No other planned power project could be developed as quickly as the Bersimis River job," he said. The needs of Montreal were growing rapidly and this was the quickest method of coping with this city's requirements, as visualised by experts, from 1956 onward. Located in the vast, unexplored country on the North Shore of the Gulf of St. Lawrence, the site is 85 miles from the coast. The present site has a potential of 1,000,000 h.p. Further downstream, the water could be re-used to develop an additional 500,000 to 1,000,000 h.p.

Scheme for British Guiana

It is reported from New York that Mr. Adrian J. van Staalen, a Dutch engineer and United Nations expert, is to visit British Guiana at the request of the government of the territory to study the possibility of furthering hydro-electric development. Mr. van Staalen will study the possibility of providing electric power to process the bauxite resources in the colony. If the bauxite processing does not prove to be economical, the possibility of hydro-electric development on a smaller scale is being contemplated for general use.

A Further Loan

India is to receive a 25-year loan of $19¼ million from the International Bank for Reconstruction Development, which is to be utilised for the construction of further stages of the Damodar River Valley project. The Bank is already helping to finance three other major schemes in the project. A loan of $18¼ million was made in April, 1950, for a steam power station at Bokaro, a power transmission system and a storage dam at Koner. The Bokaro power station, with an initial capacity of 150 MW, will be the largest in India, it is stated, and is expected to be in operation in May next. The new loan will be used for a second group of projects within the programme. These are two multi-purpose dams, each with a hydro-electric plant and an extensive irrigation system.

Expansion

A new 150 k lb/hr boiler was officially commissioned last month at the Riverside power house of the Kanpur Electricity Administration by the Minister for Finance and Power, Uttar Pradesh. This would provide increasing generating capacity and would go a long way in meeting the increasing demands for power, he said. The commissioning of the boiler marked the completion of an important step in the progress of the expansion on which the Government had embarked with the nationalisation of the undertaking in 1947. The Minister then referred to steps taken towards obtaining greater production from the existing plant, and said during the five-year period under Government management the number of consumers had increased and an additional 37,000 kW of load had been connected to the system.

Kafue Gorge Scheme

Erection of two hydro-electric stations to supply the Northern Rhodesian copper belt and Southern Rhodesia with electric power has been recommended to the Northern Rhodesian government by a panel of consultants who have been examining the possibility of such a project. Sir William Halcrow was chairman of this panel, and the other members were Messrs. H. Gourley, C. H. Pickworth, and G. Kennedy. The two power stations, if built, will be sited on the Kafue river, which runs through Northern Rhodesia to join with the Zambesi River. Two steep-sided sections of this river, the Keshya Ravine and the Kafue Gorge, provide suitable conditions for the construction of the necessary dams. An initial installation of four 43 MW sets at each station is recommened.

New Station

A test operation of the largest pumping-up hydro-electric power station in the Orient, having a generating capacity of 43,600 kW, was made at Numazawanuma, in Fukushima Prefecture, Japan, recently, we learn. Work was started on the plant in November, 1950. It is estimated that the power station will have an annual output of over 51 million units.

Thailand Needs Plant

Bangkok can expect no relief from the increasingly critical lack of electricity generating equipment for at least nine months, according to an official spokesman. Seven new American generators have been ordered, but delivery is not expected until later this year, the Minister of Interior, Major-General Banyat Devahastin, has said. He blamed the power shortage on the unexpected increase in post-war electric-powered industries. General Banyat returned recently from a world tour in search of modern equipment to aid Thailand's reconstruction programme. Meanwhile, the government has announced its plan for the construction of a hydro-electric plant at Yanhee in Taark Province, to be completed in three years.

Hopes in Sydney

A promise that black-outs in Sydney, New South Wales, in 1953 would be moderate compared with last year, has been given by Mr. H. G. Conde, chairman of the N.S.W. Electricity Commission. This more hopeful outlook arose from results already achieved by the Commission's power station construction programme, he said, while emphasising that some restrictions would still be necessary. Since the middle of last year almost 100 MW of plant had been installed, including a 50 MW turbo-alternator at Pyrmont, an 18,750 kW "packaged" power station at Port Kembla, 14,000 kW of diesel plant at three sites, and an increase of 12,500 kW in output at Balmain, where a 25,000 kW turbo-alternator and the first of its two boilers have been installed. This year nearly 200 MW more generating plant would be added, including a second 50 MW set at Pyrmont and raising of the output at Bunnerong by 60 MW.

Tasmania's Claim

When the Trevallyn power development scheme is completed, Tasmania will have the largest output of hydro-electric power per thousand population in the world. This claim was made last month by the Premier, Mr. Cosgrove, at a luncheon in honour of Mr. C. Fraser Elliott, the Canadian High Commissioner to Australia, who had lauded the state's efforts in the hydro-electric field. The Premier said that, at present, Norway led the world with a production of 1,180 h.p. per thousand people. Canada was next with a production of 860 h.p. When the first Tungatinah turbine came into operation in June this year, Tasmania's figure would rise to 1,009 h.p. But when Trevallyn power station was finished, Tasmania would lead the world with a production exceeding that of Norway, Mr. Cosgrove added.

Appliance Production

Production of electrical appliances in Australia is beginning to improve after the serious slump in early and mid-1952, according to a recent survey. In past months, output of domestic appliances has shown a steady increase, although it is not expected that the total production will have reached the previous year's figures. The refrigerator industry, too, was severely hit, and some factories closed down temporarily, we learn, but there were signs of recovery in the official returns for September and October which were apparently continued in November and December. It is estimated that Australia's manufacturing capacity for the majority of appliances is now sufficient to meet local requirements, although it is admitted that high labour costs, compared with overseas countries, make Australian manufacturers extremely vulnerable to imports, and more particularly to "dumping" in the event of overseas surpluses. It is felt that the local appliance manufacturers should return to more normal trading this year, with steadily improving production resulting from the wider use of electrical domestic appliances.

Diesel Plant Wanted

Because wood is extremely scarce on Thursday Island, Queensland, homes, bakehouses, and small industries have to depend on electricity for heating. The demand has exceeded the power supply and extensions to the generating plant at a cost of £40,000 are now being carried out. The Director of Local Government, Mr. Sewell, who is also civic administrator of the island, has said that the new plant had become necessary to obviate rationing of electricity and to meet the growing demand. Three Diesel-operated units are being installed. The distribution system is being extended. The first of the new units should be operating within about a month.

PERSONALITIES

IN THE INDUSTRY

The Simplex Electric Co. Ltd. has appointed **Mr. Gilbert D. Mason** as sales manager, conduit, conduit fittings and switchgear. Mr. Mason, who has been connected with electrical and allied industries since 1929, served with the Yeomanry and later with the Commandos during the last war when he completed 5½ years overseas service before joining Simplex in January 1946. Since then he has been responsible for Simplex flameproof equipment sales in the London area, and has represented the company in the oil industry.

Mr. Gilbert D. Mason

Mr. A. A. Millar, M.I.Mech.E., electrical engineer for the Cumberland area of the Northern Divisional Coal Board has been appointed chief electrical engineer to the Central West Area of the Scottish Coal Board. Before nationalisation of the mines, Mr. Millar was chief electrical engineer (mining) for the Workington Iron and Steel Co. He takes up his new duties in April.

It is regretted that **Mr. G. B. Morrison,** the London and Home Counties representative of the Universal Boilers and Engineering Co., Ltd., is to undergo a major operation and is not expected to return to duty for several months. Mr. Morrison's many friends will join in wishing him a speedy and complete recovery.

Mr. W. L. Wray, managing director of Wandleside Cable Works, Ltd., is leaving by Comet for South Africa on Saturday next, February 7, on a business tour. Besides the principal cities of the Union, he will visit also, on the return journey, the Rhodesias and East African territories. Mr. Wray is also chairman and managing director of the newly formed company, Irish Cables, Ltd.

Mr. J. E. Smith, general manager of the wholesale division of the Canadian General Electric, has been elected president of the Association of Professional Engineers of Ontario.

Simon-Carves, Ltd., announce that three of their directors, **Mr. D. T. Barritt, Mr. H. Clarke** and **Mr. J. P. V. Woollam,** have been appointed joint managing directors of the company.

Mr. D. T. Barritt

General works manager of C. A. Parsons and Co. Ltd., **Mr. G. M. Baker,** has been appointed a director of the company. It is also announced that **Mr. E. B. Preston** has retired from the position of London office manager for the company, and his successor is **Mr. J. L. Packard,** who was for a number of years their district manager for South West England, operating from headquarters at Bristol.

Mr. G. M. Baker

Mr. J. L. Packard

Deputy station superintendent at Littlebrook power station, South Eastern Division, B.E.A., **Mr. W. G. B. Orford,** A.M.I.E.E., is shortly to take up the position of chief of plant at the Piratininga steam power station at Sao Paulo, of the Brazilian Traction Light and Power Co. This new station, which is to have a capacity of 180 MW, is expected to be in operation next year. Mr. Orford leaves for Brazil in a few months time, we understand.

Mr. R. L. Brown, chairman and managing director of Hopkinsons, Ltd., has arrived by air in Johannesburg for a business visit to South Africa. He intends to stay until about the middle of March.

Mr. John Aspinall, M.B.E., M.I.Mech.E., works director of Hick, Hargreaves and Co., Ltd., has been appointed assistant managing director of the company.

Mr. H. Clarke

Mr. J. P. V. Woollam

We learn that **Mr. J. B. Coates** has been appointed an executive director of Berry's Electric, Ltd. After a switchgear apprenticeship, Mr. Coates was engaged in design, commercial and production work with the English Electric Co., Ltd., and J. H. Tucker and Co., Ltd. During the war he served with R.E.M.E., and he joined Berry's in 1950.

Mr. J. B. Coates

Mr. W. T. Porter, of the Bristol electrical contracting concern of that name, was last week the recipient of a presentation to mark his retirement from the Bristol branch of the Electrical Contractors' Association, with which he has been associated for 29 years. Mr. Porter is a former chairman of the branch and has held almost every office. The presentation was made by **Mr. H. Harding,** of the E.C.A. and B.E.A. Co-operation Committee for the South West.

Mr. John Blake, head electrician for 16 years at Philadelphia Dorothea Pit, Co. Durham, has received a presentation on leaving to go to the nearby Harraton Colliery.

Mr. V. A. Higgs, B.SC.(HONS.), A.M.I.E.E., A.M.A.I.E.E., A.F.R.AE.S., has been appointed manager of the Aero and Auto Equipment Sales Department of the British Thomson-Houston Co. He has been assistant manager of the department since March 1951, and now succeeds **Mr. E. Sayers,** who retired at the end of January after 20 years as manager of the department, and a total of 48 years in the service of the company. In his early service for the company Mr. Sayers travelled widely as foreign export representative, specialising in meters, instruments and voltage regulators, but later when the Coventry works concentrated on the manufacture of h.t. magnetos for aircraft, he turned his attention to that field in which he has become particularly well known. Mr. Sayers served on various technical committees. Mr. Higgs, his successor, obtained early training as an apprentice with B.T.H., and subsequently spent six years as a design engineer. During the war he was senior technical officer at the M.A.P., but in 1946 he returned to B.T.H. at Coventry.

Mr. V. A. Higgs

Mr. E. Sayers

Mr. H. C. C. Keen

Mr. E. W. Faithfull

The South Wales Electricity Board announce that **Mr. H. C. C. Keen,** A.M.I.E.E., formerly senior commercial assistant, Croydon district, South Eastern Electricity Board, has been appointed district commercial manager for No. 462 district (Newport, Mon.), in succession to **Mr. E. W. Faithfull,** A.M.I.E.E., who has been promoted to senior assistant (low voltage) in the chief commercial officer's department of the Board at St. Mellons. Mr. Keen served his apprenticeship with the Reigate Corporation undertaking, with which he became assistant consumers' engineer after the war. He later joined the Bromley Corporation undertaking as senior assistant consumers' engineer. Prior to March 1951, Mr. Faithfull was district commercial officer, Aberystwyth district of the Merseyside and North Wales Electricity Board. He was borough electrical engineer and manager at Aberystwyth from July 1946 to March 1948. Earlier he had been power sales engineer at High Wycombe for five years, after experience at Bridport and Seaton, Devon. The South Wales Board also announce that **Mr. M. F. Fry,** A.M.I.E.E., assistant engineer, Luton district, Eastern Electricity Board, has been appointed senior assistant engineer at the S.W. Board's Western sub-area.

After 21 years as manager in Scotland for Lancashire Dynamo and Crypto, Ltd., **Mr. G. S. Helme,** T.D., A.M.I.E.E., has retired, but the company will continue to use his services as a consultant. He is succeeded by **Mr. W. J. A. Gemmell,** who has been in L.D.C.'s Scottish Sales Office since 1932. Mr. Helme was educated at the Royal Salford Technical Institute and the Royal Technical College, Glasgow. He joined the Trafford Park works of Lancashire Dynamo and Crypto, Ltd., as an apprentice in 1906 and, by arrangement with the company, completed his training with Hick Hargreaves and Co. In 1909 he went to Glasgow and for five years was a partner of Kelsall Parsons and Co., at that time agents in

Mr. G. S. Helme

Scotland for L.D.C. During the war he also served as representative of D.I.E.E., in Scotland, and he is at present on the I.E.E. Council for S.W. Scotland. Mr. Gemmell graduated (B.SC.) from Glasgow University in 1924. During his university training and until 1925 he carried out a student apprenticeship in the British Railway workshops in Glasgow (then L.N.E.R. Co.'s works), and in B.T.H. Co.'s works in Rugby. For the next four years he was employed by a Glasgow company which merged subsequently with Allen West and Co., Ltd., and in 1929 became sales engineer and outside service engineer with Kelsall, Parsons and Co.

We are now able to reproduce the photographs of **Mr. E. W. Jones** and **Mr. C. L. Townsend,** ASSOC.I.E.E., who, as we noted last week, have been

Mr. E. W. Jones

Mr. C. L. Townsend

appointed by the South Wales Electricity Board as sub-area managers of the Central and Eastern sub-areas respectively. Mr. Jones has held his present position of manager of the board's Eastern sub-area since April, 1948. Prior to that he was engineer and manager of the Mountain Ash electricity undertaking which many will recall in connection with its very low domestic tariffs. Mr. Townsend has also been a sub-area manager for the Western sub-area, since April 1948. He was earlier engineer and manager of the West Cambrian Power Co. and its associated companies, an appointment which he had held since 1933.

OBITUARY

The death has occurred in Washington, D.C., of **Dr. Charles Moon,** head of the inductance section of the United States Bureau of Standards. A specialist in very fine mechanical work on electrical standards, he materially assisted in establishing the ohm as the international standard of measuring electrical resistance.

We now learn that **Mr. H. K. Schrage,** M.E. and E.E., the inventor of the three-phase rotor fed commutator motor with shunt characteristic and speed regulation by brush shifting, bearing his name, died on November 24, 1952, age 69, in Zurich where he lived after his retirement. Born in Usquert in the Netherlands, he graduated as a mechanical engineer at Delft in 1905 and studied electrical engineering under Prof. Arnold in Karlsruhe. In 1908 Mr. Schrage entered the testing department of the ASEA Electrical Cy at Vasteras (Sweden) where he became an assistant of La Cour and worked on the development of a.c. commutator machines and in 1910 he invented the Schrage-motor. He left ASEA in 1914 and worked in Oslo and Stockholm until 1920. After a short stay in Holland he joined, in 1923, the Thomson Houston Cy in Paris until 1927, when he was appointed a principal of the construction department for a.c. commutator machines of Brown Boveri Cy, Baden, Switzerland. Here he developed special armature windings which made possible the construction of three phase commutator motors for high speeds until retiring in 1948.

The death has occurred at Coxhoe (Co. Durham) of **Mr. E. T. Roberts,** area manager of the North-Eastern Electricity Board's engineering department. He was 57 years old.

Mr. Arthur Stanley, managing director of Simon-Carves, Ltd., from 1901 until retiring in 1936, died on January 27, aged 87. He was the only surviving member of the personal staff of the late Mr. Henry Simon who founded the firm.

Mr. Harold Constable, street lighting inspector to Harrogate Corporation, died on January 18, aged 49. He had been in charge of the corporation's street lighting and the seasonal decorative lighting schemes.

Engineer Commander J. C. Hawkes, O.B.E., D.SC., Emeritus Professor of Engineering at King's College, Newcastle-upon-Tyne, died on January 30, aged 73.

BRITISH STANDARDS

Portable Fire Extinguishers of the Foam Type (Gas Pressure). *B.S.* 740, *Pt.* 2 : 1952. *Price* 6*s.* In this type of extinguisher the extinguishing medium (foam) is expelled by means of pressure resulting from compressed or liquefied gas from a pressure container attached to, or fitted into, the extinguisher. The standard gives full details of the requirements regarding method of operation, performance, anti-corrosion treatment and chemical charge to be used in the extinguisher, as well as specifying the riveted and welded construction of the extinguisher for all details, together with the necessary fittings. Additional clauses are also given covering method of test and marking.

Temporary Prevention of Corrosion on Metal Surfaces. *B.S.* 1133: *Section* 6: 1953. *Packaging Code. Price* 10*s.* 6*d. net.* This section of B.S.1133, dealing with the packaging of metal or metal products for transportation, is an adaptation of the war-time Section 3 of the same Standard to ordinary commercial practice. There is, however, one important difference between the two in that, whereas considerable reference to government specifications for corrosion preventatives was practised in the former edition, performance specifications for the preventatives have been included in this publication.

Standards reviewed above may be obtained from the British Standards Institution, Sales Branch, 24 Victoria St., London S.W.1, at the prices stated.

Electrical Research

Spark Ignition and Insulator Life considered in Latest E.R.A. Reports

SPARK ignition, insulator spindle corrosion, the relation of wind power sites and a new design of high speed c.r.o. are amongst the subjects dealt with in the latest batch of technical reports to be published by the E.R.A. That on spark ignition deals with the effect of series resistance on the energy dissipated in a capacitative spark discharge across small gaps. (G/T253, by H. G. Riddlestone.)

The background to this report is a series of measurements made by the U.S. Bureau of Mines. Non-inductive resistors of values up to 30 ohms were inserted in a capacitative discharge circuit and it was found that this had no effect on the value of the minimum energy required for ignition. In view of this result, the E.R.A. decided to carry out measurements to determine the electrical effect of added resistance on the energy dissipated in the discharge of such circuits.

Energy and Resistance

Results obtained show that the energy dissipated in capacitative spark discharges across small gaps decreases with increased circuit resistance in the range one to 70 ohms. In view of the U.S. finding that the incendivity of the discharge does not fall off, it follows that the energy dissipated in the discharge is not the only factor in ignition. In the report suggestions are made that such factors as energy density in the discharge and the rate at which the discharge is built up may, in fact, be important factors.

The report on corrosion deals with penetration of galvanising on the head of an insulator spindle, due to contact with the lead thimble in the insulator. (O/T8, by G. Mole.) Such action continues as a rusting of the then unprotected steel, and may materially shorten insulator life. There is evidence that the process will be particularly rapid on spindles exposed to salt spray. Remedial measures suggested in the report include the use of thimbles of other materials (zinc, aluminium or polythene) or the use of a polythene coated spindle.

In many spindles which were examined, there was evidence of attack at the level of the bottom of the insulator skirt. This suggests an action due to corona or sparking. Spindles which had been in service for 40 years or so were all severely corroded, and appeared to have been attacked both by dissimilar metal contact and also as described above.

New C.R.O.

Measurements in high-voltage circuits such as surge-generators is the duty of the c.r.o. described. (S/T70, by E. L. White.) It is a sealed-off type, and the sweep is initiated by a thyratron-controlled tripping circuit with an overall delay of the order 5×10^{-8} seconds. The cathode beam is swept across the screen by a single-stroke hard-valve circuit in times varying from 0·2 to 300 micro-seconds. A nearly rectangular pulse derived from the sweep circuit is applied to the modulating grid of the tube to initiate the beam and maintain it at constant current for the duration of the sweep.

The final report in this series gives a lengthy review of the selection and characteristics of wind-power sites. (C/T108 by E. W. Golding and A. H. Stodhart.) Obviously, the site must have an annual wind velocity duration characteristic which is suitable. For similarly shaped hills in the western coastal districts of the British Isles, this requirement reduces to an average annual wind speed of 20 to 25 miles if wind generation is to be potentially economic.

Smooth Hill Shapes

A fairly steep smoothly shaped hill gives good results when it is well exposed and is free from screening by higher ground within a distance of three to four miles. In the survey recorded, the choice has usually fallen on hills with a maximum slope of one in three and not farther inland than two to three miles. The relative advantages of isolated, roughly conical hills and of ridges has not yet been determined.

Although the advantages of a good foundation and of reasonable site access are apparent, their degree of importance is uncertain while the optimum spacing between wind rotors is unknown. Tentatively, a horizontal spacing of eight to ten times wind rotor diameter is being accepted as the minimum required to avoid interference by one rotor with another due to such factors as air turbulence.

REPORT FROM TASMANIA

PROGRESS during the year, despite financial difficulties, is recounted in the Tasmanian H.-E. Commission's Report for 1951-52. Dissatisfaction is, however, expressed in the Report with the method at present existing for financing large works. It is pointed out that despite parliamentary approval of projected works, finance is made available for the current year only, although committments have to be entered into for plant and materials which may be required as far as three years ahead.

Principal construction work undertaken included the Pine Tier Dam, the canal and flume sections, earth dams and levees in the Upper Nive Development, the completion of the outlet tunnel from Tungatinah Lagoon leading to the penstocks above the Tungatinah power station, and the station building foundations and steelwork. Butlers Gorge dam and power station have been completed and work was begun on site clearance and preliminary construction work at Wayatinah and Lake Echo. Unfortunately, owing to financial restrictions, work on the latter scheme will not be able to go ahead at the rate as was originally planned.

Rationing of power, originally introduced in 1951, was retained during 1952, permissible output being based on the stage of development of the system coupled with the long-term average rainfall. Total water storage, due to a higher-than-average rainfall during the year increased to 50·5% of total storage capacity on June 30, 1952, compared with 38·5% at the same time the previous year. The Great Lake storage, however, remained low due to the several years of low rainfall and the heavy power demand.

Even if the alternators and steel penstocks for Tungatinah are delivered from overseas in time for operation by the middle of 1953, it will not be possible to lift rationing from the retail consumers, and the position will not be secure until completion of the Lake Echo and Wayatinah power schemes.

Total installed capacity is 211,700 kW and the potential demand increased by about 20% over the previous year. This was held down to 11% actual increase by rationing.

CINEMA SAFETY LIGHTING

SAFETY lighting and primary maintained lighting is the subject of a new Code of Practice which has been issued in draft form by the B.S.I./I.E.E. committee responsible, with an invitation to interested parties to submit comments. Under the Cinematograph Regulations 1950, auditoriums are required to be illuminated during performances sufficiently well to enable audiences to see their way out. The lighting serving this purpose is required to be derived from a supply separate from that used for the general lighting of the premises.

The code recommends that the auditorium should normally be lighted by both the general and the safety-lighting systems, and the detailed recommendations applicable to each individual lighting system are made on the assumption that this is done. It is suggested that a battery of lead acid or alkaline cells should normally be provided for the safety lighting, although private generating plant may be used if the general lighting is taken from the public supply.

The illumination afforded by the safety lighting in the auditorium is recommended as being such that a person with normal eyesight, after viewing a film for at least five minutes, can see his way to the nearest gangway after a visual adaptation period not exceeding ten seconds. For this purpose appropriate illumination levels are likely to lie within the range 0·001 to 0·0025 lumens/sq ft. It is preferred that the illumination should originate behind and above spectators seated in the auditorium. In certain circumstances, the use of indirect safety lighting may be acceptable; otherwise the use of deep conical or similar fittings which may be recessed in the ceilings is recommended.

Illumination Level

Illumination from the primary maintained lighting, which is added to that from the safety lighting, may vary over a wide range, but tests have shown that it is often of the order 0·005 lumens/sq ft. In general, the illumination should diminish gradually from the rear of the auditorium towards the screen.

Safety lighting outside the auditorium should give a minimum illumination on stair treads not below 0·05 lm/sq ft, and preferably not below 0·1 lm/sq ft.

Besides the points summarised above, the draft code makes provisions for tests, maintenance and many details of installation, and also has technical appendices. It is available from the B.S.I., 24 Victoria Street, London S.W.1, price 2s. (Reference CO(CME)5119). Any comments should be sent to the B.S.I. by February 23, 1953.

NEW LITERATURE

Major Faults on Power Systems

by A. G. Lyle, M.Sc.(Eng.), M.I.E.E.

THERE will be many who, after glancing through this book, feel inclined to quarrel with the author's choice of title. If, however, they take the trouble to read Mr. Lyle's preface, they will find the title explained, and the contents of the volume epitomised. Though most of the text must deal with circuit-breakers, relays and other apparatus rather than with the exciting events which may follow a fault, all these details are discussed from one firm point of view: seeing what is likely to happen when a fault occurs, and estimating probable values of current and voltage.

After an introductory chapter on lighting, there is a brief consideration of the possible consequences of faults. Fault calculations are then introduced, with the emphasis on symmetrical components and vector algebra, and after this comes the major section of the book. This deals with protection, in terms of c.ts, relays, circuit-breakers and lightning arresters. In every case the description of construction and of the principles of operation is supplemented by relevant representative calculations.

The final section of the book discusses system design as a co-ordinated subject, and the difficult problem of neutral inversion, concluding with some notes on recent advances in protection technique. Though the calculations that occur throughout the book do not make for easy reading, they undoubtedly lead to a clear understanding on the part of the persevering student, while any such user will have good cause to thank the author for the extensive bibliography he has provided. Published by Chapman and Hall, 355 pages, 8½ by 5½ in. Price 45s.

Wood's Practical Guide to Fan Engineering

edited by W. C. Osborne, B.SC.(ENG.) and C. G. Turner

ARRANGING for the ventilation of a house, workshop, or public building often seems a very simple business : it is only when the "amateur" designs are completed and put into operation that the snags become all too apparent. The answer, of course, is consult an expert—but he is not always available, for one reason or another. It is to meet this situation that the present fact-packed book has been prepared. In it are discussed the principles of ventilation in relation to human comfort, and the techniques by which these principles may be applied in practice : and throughout the general discussion of such topics is supplemented with tables, curves and diagrams which are certain time-savers.

For the electrical engineer, the sections most likely to be of interest may be noted specially. These concern the types of fan in common use, their characteristics alone and in combination, and the considerations necessary in making a selection from amongst them; and the electric motors used for fan drives. This last chapter is excellently done, with notes on protective gear as well as characteristic performance curves. Published by Woods of Colchester Ltd., 227 pages, 9 in. by 6 in. Price 10s. 6d.

Wireless Fundamentals

by E. Armitage, M.A., B.SC.

IN adding this book to the many already treating of the subject, the author claims to serve an intermediate class of reader, who has a knowledge of elementary d.c. theory but no advanced mathematical equipment at the level of the calculus. To instruct such a reader it is likely to be necessary to hold his interest, and it is greatly to Mr. Armitage's credit that he reacts to this inference with an arrangement which sandwiches the solid considerations of a.c. theory between the discussion of valves and other circuit components and then of actual circuits. For the rest, the book deals with the usual subjects, extending up to the principle of the superhet without developing this. Published by Pitman, 363 pages, 8¼ by 5¼ in. Price 18s.

BOOKS RECEIVED

Radio and Radar Technique, by A. T. Starr. Covers whole range of subject so far as methods and techniques are concerned, but omits applications. Advanced level. Published by Pitman, 812 pages, 9 in. by 6 in. Price 75s.

Essentials of Microwaves, by R. B. Muchmore. Presents basic principles in physical pictures at expense of mathematics. Published by Chapman and Hall, 236 pages, 9 in. by 5¾ in. Price 36s.

Dynasty of Ironfounders, by A. Raistrick. Engineering history over 250 years, seen as the technical progress of the Coalbrookdale Company. Published by Longmans Green, 308 pages, 8¾ in. by 5¾ in. Price 30s.

Radio Upkeep and Repairs, by A. T. Witts. Practical handbook on fault finding and repair. Published by Pitman, 220 pages, 7¼ in. by 5 in. Seventh edition, price 12s. 6d.

The Cathode Ray Oscillograph in Industry, by W. Wilson. Standard text book on applications of the c.r.o. Published by Chapman and Hall, 273 pages, 8½ in. by 5¼ in. Fourth edition, price 36s.

Solution of Problems in Strength of Materials, by S. A. Urry. Brief notes on theory, worked solutions, and questions with answers, at H.N.C. level. Published by Pitman, 381 pages, 7¼ in. by 4¾ in. Price 20s.

Photometry, by J. W. T. Walsh. Comprehensive standard text book. Published by Constable, 544 pages, 9¼ in. by 6 in. Second edition, price 63s.

Higher Industrial Production with Electricity. General survey for the industrialist and factory manager. Published by the Electrical Development Association, 146 pages, 8¾ in. by 5¼ in. Price 8s. 6d.

The BUYER'S *Column*

Lightweight Iron has Cast-in Element

WITH the interest in domestic appliances circles being currently centred on the advantages of lightweight in electric irons, our attention is focused on the "Sylph" lightweight iron which is marketed by PREMIER ELECTRIC HEATERS, LTD., Keeley St., Birmingham 9.

This iron priced at 59s. 6d. weighs only 3¼ lb and incorporates automatic heat control and has been so designed that it incorporates a special back-rest which ensures perfect balance and stability.

A remarkable departure from the conventional is to be noted in the element of the "Sylph" which is a "Premicoil" element, a special wire-coil element, perfectly insulated, enclosed in a metal tube and cast into a light alloy base plate.

Experience abroad with this type of element has indicated that it is almost everlasting. Tests conducted at the Premier Works during the course of which production model "Sylphs" have been on continuous circuit for over 15,500 hours without breaking down. If one assumes that an electric iron is used for three hours a week, the "Sylph" element would last well over a lifetime at this rate. In support of this point the makers say that although there are many thousands of "Sylph" irons in use today, less than six irons in every ten thousand in failures brought to their notice have failed due to faulty elements.

Premier's Sylph has an element cast in the sole plate

The Inter-Talk Type E38/E39

LATEST addition to the range of "Callboy" intercommunication equipment is the new E38/E39 type loud to loud speaking units which has been marketed by EASCO ELECTRICAL LTD, Brighton Terrace, S.W.9.

The Master unit, type E38, has a neat facia panel incorporating operating keys and pilot light, all incorporated in a pleasing metal case. It is provided with a half-wave metal rectifier with adequate smoothing circuits to provide H.T. for a small high-gain amplifier. A 5 in. p.m. speaker is fitted, which is used as both microphone and loudspeaker. The speaker grill is of bronze expanded metal, which tones well with the polychromatic bronze hammered finish of the casing.

The substation unit, type E39, is similar in appearance, but has only the 5 in. speaker mounted in a metal case, and a spring-loaded toggle switch used to call the master station.

Suitable for use on 200/250 V a.c., 40-60 c/s supplies (or 100/125 V a.c., 40-60 c/s supplies to order), the Inter-talk installation is rated at 20 W. Price of the two units combined is 16 guineas.

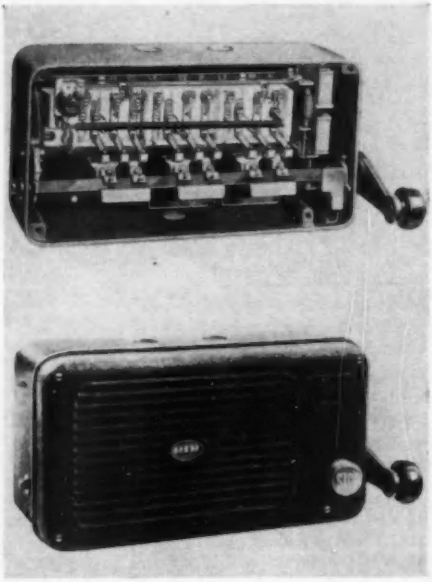
This is the Fusemaster screwdriver which we described in our last week's issue. It is distributed by L. J. Hydleman and Co., Ltd.

"Memota" Restyled

REAPPEARING, restyled and modernised, the "Memota" star delta starter by MIDLAND ELECTRIC MANUFACTURING CO., LTD., Tyseley, Birmingham 11, has now been extended in rating to control motors up to 20 h.p.

External improvements include the restyling of the case in which all external fixings and hinges have been removed and the magnet coil and trip mechanism fitted inside the case. The operating handle has been improved and a prominent mushroom head stop button introduced on the front of the case.

The load indicator has been improved and setting is now much simplified. Otherwise, the salient features of former "Memota" models have been retained. Contacts are of heavy gauge and are readily accessible for inspection and cleaning.



Thermal overload trips are fitted. Provision has been made for top and bottom entry wiring.

The new "Memota" starters are contained in dust-protecting cases, suitable for normal conditions and finished in black wrinkle enamel. The cases of the 15-35 amp ratings are lined with white insulating enamel.

Heatrae Farm Pressure Boiler

THIS boiler, marketed by HEATRAE LTD., Heatrae Works, Norwich, is a natural development from the successful range of farm food boilers which have been in use for several years.

The pressure type boiler is offered in one size, nominally 36-gallon, with standard loading of 6kW. It is designed for a working pressure of 10-12 lb p.s.i. The lid for making the enclosure steam tight is of the internally fitted pattern.

This has the advantage that it is not possible to remove it unless the pressure has been reduced to zero. In order to keep the lid in position before any pressure is developed, it is held up by means of a bridge piece and a hand wheel and screw, which also incorporates the relief valve. So should any attempt be made to remove the lid while the boiler is still under pressure, the pressure must be relieved before anything can happen.

The working pressure is controlled by means of a dead-weight valve which is held off its seating until steam is passing freely through it. As soon as all the air has been removed, the control valve automatically drops on to its seating and pressure commences to rise. A safety valve is provided to relieve excess pressure if the control valve becomes obstructed.

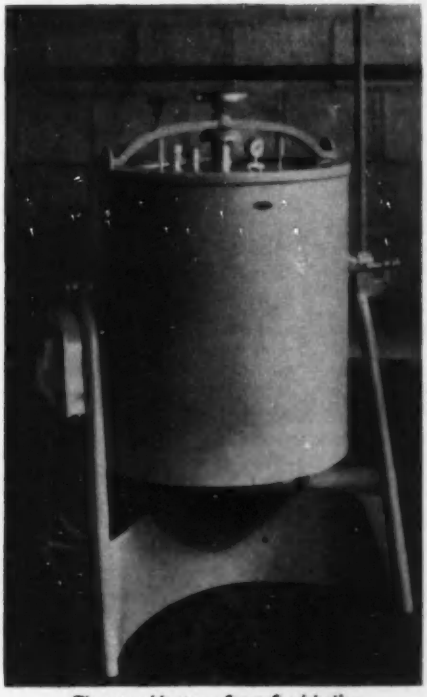
The loading is 6 kW and the switches controlling this are built into a small panel attached to the stand on which the boiler tilts. There are two switches, one controlling 4 kW, the other 2 kW. When first switched on the full 6 kW of load is used but as soon as working pressure of 10 lb p.s.i. has been obtained the loading is automatically reduced to 2 kW to maintain the pressure. This secures utmost economy in working.

The pressure boiler can be used for processing any class of farm foods and as far as potatoes are concerned, approximately 2 cwt of these can be cooked in two hours with a consumption of approximately five units per cwt. The boiler is completely satisfactory for processing pig swill.

A fender plate is now fitted to the front legs of the stand so that if any food is tipped direct on to the floor it does not become lost beneath. The tilting mechanism is also provided with a locking device in four positions. The boiler is for use on a.c. only, 200/250 V. Price £77.

Canadian Bumpers for NCB Electric Vans

HEAVY duty reinforced rear bumpers incorporating a step and curved round the corners of the body following the practice of vehicle builders on the North American continent were recently fitted to N.C.B. Electric bakery vehicles shipped for operation in Hamilton, Ontario.



The new Heatrae farm food boiler

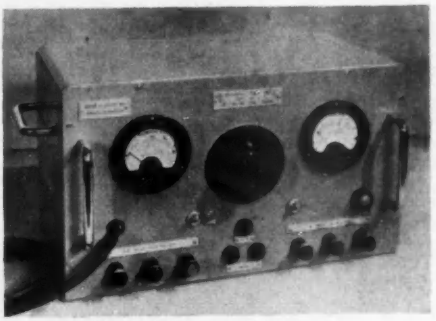
SMITH'S ELECTRIC VEHICLES LTD., Princeway Team Valley, Gateshead-on-Tyne, say they are in a position to supply Canadian type rear bumpers with or without radiator protection front fender to chassis manufacturers and bodybuilders for any type of vehicles.

Stabilised Power Supply

FIRST of a range of laboratory electrical equipment to be marketed by HARVEY ELECTRONICS LTD., 273 Farnborough Road, Farnborough, Hants, is a stabilised power supply unit, Type 100, which has been designed to provide stabilised d.c. power supplies for laboratory use up to 120 MA at 200-350 V and which also has terminals for taking 6·3 V and 4V unstabilised a.c. supplies.

The makers say that the unit has high stability, very good regulation, low source impedance and freedom from noise and ripple. The stabilising system is based on a series hard valve, the voltage drop through which is instantly adjusted by a difference voltage based on a bridge circuit one leg of which is a special high stability neon. This voltage difference at the centre of the bridge being amplified by a high gain pentode and applied to a series control valve. The whole system is floating and either side of the output may be connected to earth.

The unit is housed in a stout steel case finished in hard grey enamel, hand polished.



Harvey's power stabiliser unit

TRADE PUBLICATIONS

TRANSFORMERS.—Recently published brochures by Gresham Transformers Ltd., Twickenham Road, Hanworth, Middx.

FLUORESCENT LIGHTING.—One broadsheet and five leaflets issued by Smart and Brown (Engineers) Ltd., Trading Estate, Spennymoor, Co. Durham, describe the range of fittings and control gear. These can be obtained from the firm's Home Sales Office, 8 Rose and Crown Yard, King Street, St. James's, S.W.1, or from any of the firm's branches.

SPEECH OVER THE MAINS

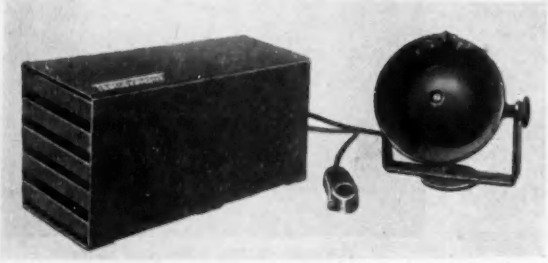
"Trolley phone" system uses carrier currents over existing wiring

NOW built under licence in this country by Clifford and Snell Ltd., Carshalton Road, Sutton, Surrey, the British Trolley-phone is a frequency modulated carrier current system which carries two-way speech clearly over existing electric power or lighting circuits up to a range of four miles over normally loaded lines.

The advantage of a communications system which permits two-way loudspeaking conversation over any existing network up to such a range will be most obvious to our readers.

The scope of such an installation is indeed wide. Its use would be of paramount importance in emergencies of any kind—floods, storms, rail and air crashes, earthquakes and other commotions. Other applications to which the system lends itself are the control of ore, coal and coke, handling bridges, soaking pit cranes, strip mills, yard locomotives, cranes, construction sites, chemical plants, etc.

The model 2110 which we illustrate comprises a transreceiver and loud hailer type 8½ in. speaker and a press to talk hand microphone. All components are housed in a shock mounted heavy duty case. Power is taken from a common mains supply it being desirable that this should be from the same phase. Equipment can be either a.c. or d.c.



The F.M. carrier current operates in the region of 100 kc/s. R.F. output into the line is 10 W. Total consumption being 150 W. Maximum distance depends on local conditions, but on normally loaded lines is effectively four miles. Volume control is automatic and speech is as loud at a distance from the unit as close by. Dimensions of the case are 19 by 7½ by 10 in. high. Price of a.c. or d.c. equipment is £130 ex works per station (transreceiver, microphone and speaker).

The WEEK in NEWS

Supply Damage not Extensive

Only Littlebrook and Deptford E. seriously Flooded

EARLY reports reaching us concerning the effects of gales and floods along the East Coast indicate that the electricity supply industry has emerged from the disaster relatively free of trouble. Damage to power stations has been slight, it is understood, the three most seriously affected being Littlebrook "A" and "B," and Deptford East. At the first station, water flooded the basement to an average depth of 2 ft or 3 ft, and the station's whole output of 115 MW was lost at midnight on Saturday. Supplies were fully restored on Monday. At Littlebrook "B" three pumps were put into use to clear the water, but progress was slow. Complete restoration is expected there by the end of the week.

At Deptford, supply was interfered with early on Sunday morning, and flooding caused the loss of about 90 MW of output. The whole of the auxiliary plant housed in the basement was affected by the flood water. Two sets were back in commission early on Monday. At the time of going to press it was expected that the station would be back in full operation on Wednesday.

Three stations were affected in the Eastern Division, namely, those at King's Lynn, Yarmouth and Ipswich (Constantine Rd.). Yarmouth was the most seriously affected, but normal operation was restored on Monday. Little essential plant suffered.

Information from the S.E. Electricity Board revealed that the Board was in no trouble. Exact estimates of the effect on consumers could not be judged until flooding subsided, but damage was not considered to be extensive. Broadly, wherever a home was habitable, a supply of electricity was available. Assessment of damage in East Anglia was difficult to ascertain.

The Erith Works of B.I. Callender's Cables suffered severely. Production was brought to a standstill. Deliveries are affected, but every effort is being made.

African Copper Miners Win Wage Increase

NEWS reached London last week of the result of arbitration proceedings which followed the strike of African workers in the N. Rhodesian copper mines last November. The award of wage increases, finally agreed upon, falls about half-way between the original demands of the union and what the companies were first prepared to offer. They are expected to cost the industry some £750,000 a year, but the actual effect on this country is not yet known—no comments having been offered before the text of the report is available. The effect on prices, if any, may be small, as the copper mines are at present prosperous and the additional cost of £750,000 is not anticipated to be a very great burden on the industry.

B.E.A. BORROWING NOW £110 MILLION

THE Treasury has issued a further statement of guarantee in respect of loans proposed to be raised by the B.E.A. It was given on December 29, and amounts to a sum not exceeding £110 million, relating to temporary borrowings from the Clearing Banks and Scottish Banks or other persons between January 1 and March 31, 1953. This latest statement replaces that given on October 30 when the amount involved was £75 million.

N.W. Board Stamps Scheme Extended

THE system of paying quarterly electricity bills by the periodic purchase of "savings" stamps valued at 2s. 6d. each, has been extended throughout the N.W. Electricity Board's area, it is reported. The scheme has been in operation in some towns for a number of months and it was expanded to other districts a short time ago. It has so far proved most successful. Only Manchester is now excluded from the scheme. It is said to be impracticable to operate in that city, as both gas and electricity bills are paid at the same office in Manchester. Despite this, the Consultative Council is asking that further consideration be given to the case of Manchester.

The First Half-Century

The automobile show now in progress at the Crystal Palace is undoubtedly the largest and most representative collection of motor vehicles and their accessories which has ever been gathered together under one roof. Upwards of 200 of the leading manufacturers are showing cars, the total number of vehicles on view being over 750, the stands covering a floor space of 87,000 square feet.—*From our issue February 5, 1903.*

GOVT. ANNOUNCES MAJOR EXPANSION PLANS FOR COLLEGE

LATEST move in the Government's plan to improve facilities for higher technological education in this country was announced in a written answer to a House of Commons question last week. This stated that after consulting the University Grants Committee, the Government proposed to put further resources at the disposal of the University of London, for the purpose of major expansion of the Imperial College of Science and Technology. The aim is to expand from the present total of 1,650 full-time students at the college to 3,000 during the five years 1957-62.

This announcement is the implementation of a statement made by the Chancellor of the Exchequer in June last year, when he said that the Government considered the improvement of such facilities to be a most important means of increasing productivity. They were convinced that this could best be done by building up at least one institution of university rank devoted predominantly to the teaching and study of the various forms of technology.

In addition to this move, the Government has now announced its intention of making resources available for further developments in other parts of the country. It has invited the University Grants Committee to suggest where such extra resources might be most useful.

OFFICIAL PUBLICATIONS

OVERSEAS ECONOMIC SURVEY for Haiti. H.M.S.O. 1s. 6d.

STATEMENT OF GUARANTEE by Treasury on proposed B.E.A. Loans. H.M.S.O. 2d. (*See page* 269.)

NATIONAL RESEARCH DEVELOPMENT CORPN. Report, etc., for 1951-52. H.M.S.O. 9d. (*See page* 274.)

DRAFT CODE OF PRACTICE: *Safety Lighting and primary maintained Lighting in Cinemas.* B.S.I. 2s. (*See page* 264.)

WETTING OF SLACK TO ASSIST COMBUSTION. Fuel Efficiency Bulletin No.53. H.M.S.O. 6d.

Part of display of floodlights, decorative and street lighting fittings, designed for the Coronation, staged at Chelmsford by the Essex sub-area of the Eastern Electricity Board. Picture shows the range of Chrysaline units marketed by the G.E.C. The display will be open for some weeks

S.E. Board increases Tariffs on April 1

A FURTHER step towards the standardisation of tariffs has been taken by the S.E. Electricity Board, who last week announced higher charges. The cost of electricity was raised to 1d. a unit early last year, exactly a year previous to the present increase, which comes into operation on April 1. The recently announced alterations will not affect all consumers, however. The main change is that all fixed charges of under £2 12s. p.a. in domestic two-part tariffs will go up to that figure. Minimum flat rate for cooking, heating and power is to rise from 1¾d. to 2d. a unit (2¼d. prepayment meter supplies) and similar adjustments will be made in certain block tariffs. Running rate of 1d. per unit remains. Flat rate for lighting is not affected.

The additional revenue derived from these changes, it is stated, will go to meet extra costs largely beyond the Board's control. The chairman has commented, however, that increased productivity of the Board, has the effect of limiting new revenue required to a part only of the rise in costs.

(Other tariff charges on p.244.)

Huddersfield Wins Y.E.B. Display Contest

AWARDS in the Yorkshire Electricity Board's annual window display competition held over the Christmas holiday, were presented to the winners recently by the chairman, Mr. D. Bellamy. The contest was open to all service centres and in the preliminary phases, sub-area managers were asked to select the two best displays in his district. From the final 14 submitted, the Market St. showroom in Huddersfield was eventually chosen as the winner with the Bradford centre in Sunbridge Rd. as runner-up. The silver trophy and certificates were given to the successful competitors at a luncheon when Mr. Bellamy referred to the importance of service centres.

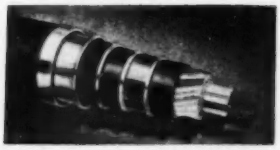
RADIO REVELS

A PLEASANT evening was spent by over 130 members and guests of the radio section of the I.E.E., last week, when their dinner and dance took place at the Cafe Royal. Mr. E. C. S. Megaw took the chair. President of the I.E.E., Col. B. H. Leeson, was principal guest and remarked that the section would reach a culminating point in Coronation year when, thanks to members' efforts, millions of people would see proceedings through television.

Plastic Cable handed over to Denmark

A NOTABLE ceremony took place in Copenhagen last week in which the principle actors were Mr. J. N. Dean, managing director of Telcon and Mr. G. Irming, managing director of the Kjobenhavns Telefon Aktieselskab. It involved the formal handing over by the British manufacturers of the first Telcothene (polythene) insulated carrier frequency multiquad land communication cables, which have been laid between Copenhagen and Roskilde.

The two cables, each about 20 miles in length, were laid last year and form part of the first stage of an extensive new telephone network being installed in the Island of Sjealland. In contrast to normal paper-insulated telephone cable, copper



conductors in these plastic type cables are completely insulated with a solid dielectric-telcothene. Water will not affect the material and consequently no lead covering is required, only a tubular Telcothene sheath. They are light in weight and fault liability is low. If the sheath should be penetrated without damaging the insulated conductors, circuit continuity is maintained.

B.E.A. WIN £33,000 CLAIM FOR EXETER'S ASSETS

JUDGMENT has been given in favour of the B.E.A. in an action brought against Exeter Corporation concerning the assets of the city's electricity undertaking. It was held that £33,355 (an amended figure), transferred to relief of rates, should have been carried forward to the year ending March 31, 1948. Costs were awarded to the B.E.A.

It was contended by the B.E.A. that under the Exeter Corporation Act, 1937, surplus revenue from the electricity undertaking should be transferred to the following year, less 1¼% of the outstanding debt, which was applicable to rate relief. At the end of 1946-47, £70,454 should have been carried forward, but in fact over £37,099 was credited and £34,185 was applied to relieve the rates, which sum was £33,355 above the amount allowed. The Corporation claimed that any amount transferred was not vested in the Authority, and under the 1937 Act revenue was merged with the general rate fund, after which it could not be identified.

Giving judgment, the Judge said the whole of excess revenue should be carried forward, the only amount to be credited to relief of rates being the 1¼%.

ZEBRA LIGHTS QUERY

WE hear that Westminster City Council is to inform the Ministry of Transport that they do not feel justified in proceeding with the illumination of pedestrian crossings until more extensive experiments have been carried out. It is maintained that flashing lights might distract attention rather than arrest it. The lighting of 103 crossings in the city is estimated to cost £18,000, and £2,500 a year for maintenance.

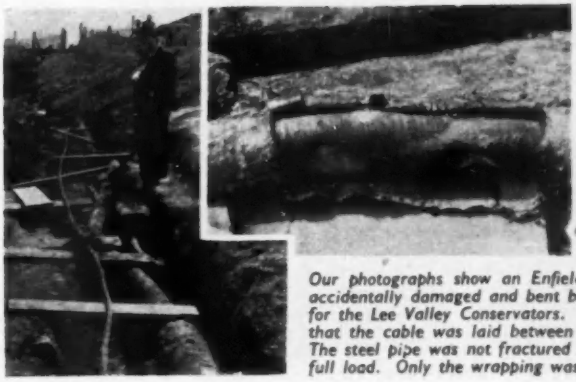
Encouraging Tests on Coal Pump

PROGRESS was made in a number of ambitious research projects by the British Hydromechanics Research Association during the year ended September 30, 1952. Details given in the fifth annual report of the Association, issued last week, show that good use is being made of the laboratory which was opened at Harlow in 1951.

Most interesting amongst the investigations noted is that concerned with the hydraulic transport of solids. Although primarily concerned with coal handling above and below ground it is thought that the results of the investigation will have applications in other fields such as ash handling. Work is proceeding with a 3 in. experimental pipeline and with an experimental "coal pump" for continually injecting coal into high-pressure water.

Other work with potential electrical industry applications includes measurements on the transient characteristics of centrifugal pumps, a general investigation into the properties of seals, packings and joints, and tests on model spillways for reservoirs.

At the recent A.G.M. of the association, there was general appreciation of one very important but unspectacular part of the work : the provision of a prompt and efficient service for dealing with technical queries.



Our photographs show an Enfield 66 kV pipe line compression cable accidentally damaged and bent by a bulldozer during excavating work for the Lee Valley Conservators. The event is remarkable for the fact that the cable was laid between Hackney and Walthamstow in 1932. The steel pipe was not fractured and the cable remained alive carrying full load. Only the wrapping was stripped off at the point of collision

A small corner of Siemens' street-lighting scheme at Newry

Newcastle E.C.A. Challenges Criticisms

IT will be recalled that in defending Newcastle City Council's action in placing a large electrical contract with a Lancashire firm, one councillor stated they were dissatisfied with some work by local contractors (see our Jan. 15 issue). This allegation was not likely to go unchallenged, and we hear that the local branch of E.C.A. has written to the Council asking them to receive a deputation to discuss the criticisms made against local contractors. In a letter to the Council the E.C.A. said they would welcome a thorough investigation into the criticisms. If work was found to be unsatisfactory on completion, it should have been detected at the time by the clerk of works.

It was pointed out that there existed a "£500 guarantee of work scheme" for safeguarding the employer. If an installation was unsatisfactory, and it was no fault of the contractor, the association would pay for correction up to £500. The letter was referred to the Housing Committee.

INTERNATIONAL PRIVATE PLANT COLLABORATION

IN Europe a new organisation has been formed to cater specifically for the interests of industrial concerns having large electricity generating plants. Many of these concerns are now exporting electricity beyond the countries in which they are situated, and the new organisation has been established under the aegis of U.N.I.P.E.D.E., to handle their problems of common interest, concerning electricity supply and distribution. Its title is the Conference Internationale de Liaison entre Producteurs d' Energie Electrique (C.I.L.P.E.), and it will utilise the U.N.I.P.E.D.E. administration. President is M. Paul Delsemme.

SIEMENS AGAIN ACTIVE IN N. IRELAND

STREET-LIGHTING engineers of Siemens Electric Lamps and Supplies Ltd. have been particularly active in N. Ireland in recent years carrying out large-scale installations at such places as Lisburn, Newtownards and Warrenpoint. These resulted directly in the latest scheme to be carried out in recent months at Newry. This last was one of the largest undertaken and involved the supply and erection of 90 class "A" and 493 class "B" fluorescent units along some 15 miles of roadway. The whole town had to be surveyed previously and the Electricity Board had to plan their mains distribution system to bring in side streets lit by gas, while providing for two new estates.

Class "A" lanterns were fitted with a special end box whereby the control gear is almost over the centre line of the column. All the castings, the roof and reflectors are of aluminium, and the whole totally enclosed by a clear Perspex bowl. Class "B" lanterns were a revised version of the Wilton Sieray Minor. All were mounted on concrete columns.

Examples of Modern British Design

BEFORE its dispatch to Bulawayo (S. Rhodesia) to form part of the U.K. Pavilion in this year's Rhodes Centenary Celebrations, the exhibition of current industrial design was on view for two days last week. The British Council have organised the assembly of goods depicting contemporary design of goods in this country, in close collaboration with the Board of Trade and Council of Industrial Design.

Electric cookers which found favour were the Baby Belling and Parnall E.C.12 cooker, while the radio sets which found a place were two made by Murphy Radio, Ltd., and Pye, Ltd. There were three electric kettles, the Daleware (John Dale, Ltd.), Premier (Premier Electric Heaters, Ltd.), and H.M.V. (E.M.I. Sales and Service, Ltd.). The last mentioned firm was also represented among the four electric iron exhibits with the H.M.V. travelling iron. The other three were supplied by Morphy-Richards, Ltd., Thorn Electrical Industries, Ltd. (Mary Ann), and the General Electric Co., Ltd. There was also a glass plate warmer by English Electric Co., Ltd., and a floor polisher and vacuum cleaner by Fillery's (Gt. Britain), Ltd.

Throughout this small exhibition were dotted various types of lighting fittings supplied by such firms as the G.E.C., British Thomson-Houston Co., Ltd., Falk, Stadelmann and Co., Ltd., and Troughton and Young, Ltd., —which selection was almost exclusively confined to the tripod style of fitting with the rod supports and simple shades. There were over 450 exhibits altogether.

NEW INSTRUMENT COMPANY FORMED

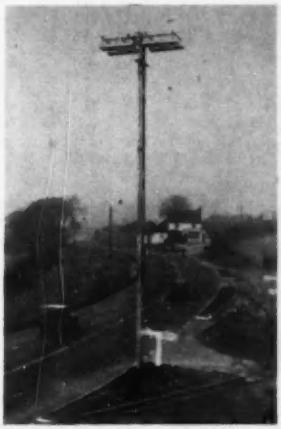
THE formation of a new company as from February 1, by the British Thermostat Co. Ltd., was announced last week. It will be known as Teddington Industrial Equipment Ltd., and will be exclusively concerned with instruments designed for use in heating, ventilating, air conditioning, process control applications and all instruments for the industrial field. The recently developed range of i.c. engine control panels and shut-down units will also be included in the new company's activities. Reason for the new firm's formation is simply one of growth.

Nerves in the Eye

AT the Royal Institution last week the Illuminating Engineering Society held their second Trotter-Paterson memorial lecture, at which Dr. Adrian, O.M., President of the Royal Society, was invited to speak. Discussing retinal nervous reactions, he described the complex system between the retina and the optical nerve and processes occurring in that region.

Lighting at the Hairdressers

WHAT are the problems facing illuminating engineers when planning an installation for a modern hairdresser's? In the first place fittings should be kept as far away from the customer and assistant as possible. Direct lighting has been found to be too strong, creating hard shadows and an element of reflected glare, especially as compared with diffused lighting. Finally, colour contrast should be constant. These difficulties appear to have been satisfactorily overcome by Holophane, Ltd., in their scheme at the Dover St. (London) salon of Arthur Coiffeurs. Step-lite close ceiling fittings embodying prismatic glass units were used, giving good directional control of diffused light from tungsten lamps. Candelabra and wall brackets were added later. Contractors were Girdlestone and Co., Ltd.



Experimental 50 ft street lighting standard erected by S.E. Electricity Board on London to Brighton (A.23) trunk road

NEW SALES POLICY

A CHANGE of sales policy has been announced by Hurseal Ltd., the heating appliance manufacturers. The company's practice of employing sole agents in various parts of the north of England is to be discontinued, and in the future dealings will be operated direct with wholesalers and retailers. At the same time branch offices have been opened in Birmingham and Manchester —the addresses being 317 Chester Rd., Sutton Coldfield, and 23 Strutt St., respectively.

50 ft. Columns in S.E. Board's Recent Street Lighting Experiments

A NOTABLE experiment in methods of street lighting is being conducted by the S.E. Electricity Board. Its object is to find a better system of illuminating large areas, which aim has particular significance in that Board's area. The experiment comprises a standard lattice-type transmission pole and four 4-light fluorescent fittings mounted at a height of 50 ft. This particular arrangement has been chosen for the main London to Brighton road at Pyecombe at the junction of the Haywards Heath Road, and by it, extremely good visibility has been achieved for some 220 yd. The height of the lamps in relation to the road surface, has been governed largely by the average life of the lamps installed, but maintenance problems have been lessened by the 5,000-hour life which fluorescent tubular lamps now have.

The unit shown in the accompanying illustration gives an illumination of about 4 lm/ft^2 at distance of 10 ft, and 0·13 lm/ft^2 at distance of 200 ft. Further application of the system would be to large squares in towns and at important road junctions. Lighting fittings in this instance were supplied by the G.E.C., and the pole by Painter Bros.

Diffused lighting is most successful at this West End hairdressing salon

Cooker for the Kwali

Some weeks ago we noted the despatch to Malaya by the G.E.C. of their new "Eastern Cooker," specially designed to accommodate the Kwali, the natives' traditional round-bottomed receptacle for cooking rice. Our picture shows the hob of the new cooker showing how it caters for the Malayan Kwali

Official Support for Inventions

LIGHT steam engines for use with boilers fired by low-grade fuel are being developed, making use of technical progress acquired in the field of internal-combustion engines. This is one of the projects which is being sponsored by the official National Research Development Corporation, whose report for the year ending June 30, 1952, was published last week by H.M. Stationery Office. The Corporation has the duty of handling patents arising from public research and also of securing the development of suitable inventions.

A notable example of this range of activities is given by the development of electrical digital computers. Ninety-nine inventions from universities, government departments, etc., and industrial firms have been assigned to the Corporation in this field. The Corporation has itself ordered four machines of the type installed at Manchester University. It has further ordered a prototype of a machine of very much reduced size based on the development of special techniques.

Many other inventions are noted in the report, and the scale of operations is shown in the balance sheet. Total expenditure amounted to £83,556, while income from the sale of patent rights and from the exploitation of inventions totalled £25,676.

Humour in the Law

ALTHOUGH intended originally as a discourse on justice, ancient and modern, the remarks of Mr. Frank Powell, a Metropolitan magistrate, at the Batti - Wallahs' luncheon last week were concerned primarily with the humorous side of the otherwise stern business of administering the law. Although his audience appreciated his tributes to the work of Charles Dickens in improving prison conditions, they also thoroughly enjoyed the many amusing anecdotes. It was later announced that the Society's Ladies' Night would take place on March 18.

NEWS IN BRIEF

There was a full house at the Grand Hotel, Harrogate, when 360 attended the annual dinner and dance of the E.C.A.'s West Yorkshire branch. Over £420 was donated to E.I.B.A., easily breaking the 1947 record of £409.

Dates of the 20th National Radio Show to take place at Earls Court, London, this year, have been confirmed. The show will open on September 2 and close on September 12.

N.C.B. has ordered five 700 kW. dual-fuel engined alternator sets with all station equipment and engine accessories, from the English Electric Co., Ltd., for the Point of Ayr Colliery.

Fluorescent lighting installation carried out by F. Reid, Ferens and Co., Ltd., in the N.C.B.'s laboratory at Wardley Colliery. Architects were Geo. T. Brown and Son and the fittings used Crompton Parkinson's AV1113 vapour proof units. Note the coincidence of the rows of fittings and the benches to be illuminated

Questions in Parliament . . .

District Heating

In reply to a question from Sir Herbert Williams, the Parliamentary Secretary to the Ministry of Works, announced on Thursday last that the Report on District Heating by the Heating and Ventilation (Reconstruction) Committee of the Building Research Board of the D.S.I.R. was being printed. It will be published about the end of May as Volumes 31 and 32 in the series of Post-War Building Studies.

Hearing Aid Batteries

Estimated cost of batteries supplied to users of Medresco hearing aids up to December 31, 1951, is £365,000, announced Mr. Macleod, Minister of Health, in a written reply last week.

Lighting Trunk Roads

Financial responsibility for the lighting of trunk roads was the subject of a question in the House last week. Mr. I. O. Thomas enquired whether the Minister of Transport had received representations from the National Association of Parish Councils and Royal Society for the Prevention of Accidents. It was submitted that the proper lighting of trunk roads was a national requirement and should be financed from the appropriate road fund. Mr. Lennox-Boyd stated he had received no representations on the subject. He could not commit himself to assuming further responsibility for lighting trunk roads. The Ministry, he added, already contributed from the Road Fund 50% of the cost of approved schemes.

Palace of Westminster Lighting

The Minister of Works was asked last week about possible improvements to the lighting in the Central Lobby of the Palace of Westminster. He was informed that general lighting would be improved and work would include the illumination of mosaics, but it would be too difficult and expensive to floodlight the windows from outside.

Science Centre

Asked what progress had been made with plans to establish a Government science centre on a site on the South Bank, Mr. Molson said he was unable at this stage to give any further information on the subject.

Training of Operative and Supervisors

Recommendations relating to the training of operatives and supervisors, made by Anglo-American Council on Productivity teams, had been brought to the notice of those concerned for their consideration, the Minister of Labour has stated in a written answer. He added that the Conference on Human Relations had been set up, industry's attention had been drawn to the need for reviewing training arrangements, and a group convened to study future developments in the training of supervisors, as examples of how the recommendations were being acted upon.

Atmospheric Pollution

Following the "great fog," the Minister of Housing and Local Government has been questioned as regards possible counter measures. Replying last week, Mr. Macmillan said that 27 local authorities had sought and obtained special smoke abatement powers since 1945. In addition, two county councils had obtained powers for use of district councils in their areas. He did not consider further general legislation necessary.

Mr. Blenkinsop asked if local authorities could be encouraged to develop smokeless zones. The Minister said there were dual problems of the right kind of fuel and apparatus to burn it in, and a nation-wide change could not be affected in a moment. Steady progress was being made in the use of new designs and methods and in installing them in large numbers of new houses. Lt.-Col. Lipton was interrupted when he alleged that complacency in dealing with the matter had created much dismay, and that the all-night burning modern domestic fires using nutty-slack have added some 250,000 fog-producing and air-polluting flues. Mr. Dodds said he intended to raise the matter on the Adjournment.

Thermal Efficiency

In a written answer on Monday, the Minister of Fuel and Power said he had been informed by the B.E.A. that the average thermal efficiency of generating plant during 1952 was 22·6%. The figure had been based on returns for January-November and an estimate for December. He did not intend to issue a directive on the improvement of coal utilisation arrangements. There was an annual improvement and the B.E.A. was fully alive to the need of improved thermal efficiency.

Load Controlling Devices

Mr. Geoffrey Lloyd was asked on Monday concerning progress in discussions on the various load-controlling devices and their uses. Replying, he said that he was not in a position to make a statement on the subject at present, as talks were still going on with electricity boards. He agreed to make a statement as soon as possible, but pointed out that it was fortunate that power cuts were less frequent now, and consequently the matter less urgent.

Lighting in the Fog

The Minister of Transport stated that no directives had been given to local authorities regarding the illumination of street lamps in fogs. The matter was left entirely to the discretion of the responsible authority.

Fuel Economy—a Statement

The Minister of Fuel and Power announced in a written answer that he hoped to make a statement next Monday on the Ridley Committee's recommendations affecting industrial fuel economy.

Electric Supply News . . .

Eastern

Two 950 kW diesel engine-driven generating sets for Southend power station, and one set of similar size for Clacton, ordered from the English Electric Co. Ltd. by the B.E.A., will each have 12 cylinder 1,350 b.h.p. engines, we learn. These engines will be direct coupled to E.E.Co.'s 950 kW alternators operating at 750 r.p.m. The alternator exciters, supplied complete with back-of-board mounting shunt field regulators, will have their armatures mounted on an extension of the main alternator shaft, characteristics of all three sets will be similar, except that the units at Clacton will generate a 6.6 kV 3 phase, 50 cycles, and the Southend sets at 11 kV.

Eire

The Electricity Supply Board is to erect a new power station in the vicinity of the Arigna coal-fields, together with a turf-burning station at Lanesborough (Co. Longford), Mr. Lemass, Minister for Industry and Commerce, stated last week. The Lanesborough station will probably be of similar capacity to the 40 MW Allenwood station, while that at Arigna may be smaller, he said. The Board had been requested to proceed with the planning and preparation as a matter of urgency.

Hereford

Perturbed by recent power failures, the district Chamber of Commerce has approached the Midlands Electricity Board on the matter. In a letter to the Chamber, Ald. W. Lewis, chairman of the Board, has stressed that since vesting date a considerable amount of reinforcement work has been approved and completed in the Hereford area. A new 66 kV line gives a complete alternative supply from Stourport, while at the Green Crize substation all the 66 kV and 11 kV switchgear is being modernised to deal with the heavier duty conditions. In addition, a new 66 kV substation is being constructed to supply the new factory to the north of the city. Further, a 10,000 kVA, 66/11 kV transformer, ordered over three years ago, has just been delivered.

Isle of Man

In the Tynwald recently the Isle of Man Electricity Board sought a grant of £16,450 to complete a scheme to supply 200 farms, the total grant for which was £76,450 spread over three years. Mr. J. R. Corrin, chairman of the Board, said they were ahead of schedule because they had purchased all the material at the outset and had not discharged any of the men working on the scheme. Only 20 of the 200 farms remained to be connected and in addition 10 extra farms and six other premises had been connected up. There were now 133 applications in connection with a new scheme which would shortly be submitted. The Speaker said the cost of construction had gone up 40 per cent since the scheme was started but the Board had covered itself largely by buying all the material at the outset. They were incurring a deficiency of £200 a year, but it was hoped the farms would use more electricity and make the scheme an economic proposition.

Yorkshire

The hearing of an appeal by the B.E.A. to the Minister of Housing and Local Government concerning the possible pollution of the River Calder, opened in Leeds last week. The dispute arises following the proposal to build a power station along the river bank and the utilisation of the water for cooling purposes, returning it afterwards, heated, to the river. The Yorkshire Ouse River Board say that the water must not be raised in temperature by more than two degrees on days when it is already above 60° F.

It is maintained by the B.E.A. that to meet these conditions the water system would have to be reorganised at annual cost of £43,000 and an increase in capital expenditure of £175,000. Should fixed temperatures be insisted on all over the country, it was likely to cost the nation about £40 million to provide necessary cooling towers, plus an additional £1,100,000 in running costs. Sir John Hacking, giving evidence for the B.E.A., said that plans for the new power station provided for two cooling towers holding 3 million gallons each. To comply with the River Board's request would mean building three cooling towers holding 3½ million gallons each.

At the hearing on Friday, evidence was given of experiments with cages of fish in the river. A biologist said if the quality of the Calder water did not get any worse, coarse fish should do well there. But Dr. J. A. Forrest, of London University, maintained that to raise the river temperature would speed decomposition and raise the black sludge lying on the bottom to the surface. On Saturday, Ministry inspectors and representatives of parties involved undertook an inspection cruise on the river.

LIGHTING SCHEMES

Amesbury.—R.D.C. has approved the erection of 27 street lamps at Holders Road, at a cost of £2,546.

Clevedon.—The U.D.C.'s application to borrow £9,373 to cover the cost of conversion of street lighting from gas to electricity has been rejected.

Cranleigh.—The Parish Council proposes to borrow £4,000 for conversion of public lighting from gas to electricity.

Omagh.—The U.D.C. is considering schemes submitted by the Electricity Board for Northern Ireland for lighting of streets by electricity. Two of the schemes suggested, costing over £12,000, propose the use of fluorescent lamps.

Company Activities . . .

Cable & Wireless (Holding) Ltd.

With a final dividend of 3% plus bonus 2%, the total for the year is again 8% for the year 1952. Group profit, before taxation, is £635,000 (*£636,687*). After providing for taxation, the total becomes £319,000. (*£373,175*).

General Cable Manfg. Co.

The steady improvement in trading, reflected in the figures quoted in the table in our January 15 issue, was referred to by Mr. C. W. R. Pantlin, chairman, at the meeting on Friday last. The plant was fully employed, and consequently it was possible to maintain a high level of production and efficiency. The present copper price level would appear to be highly vulnerable to any marginal improvement in supplies. Judging from what had happened in freeing other materials from price control, a recession in the copper price could occur on a scale which would create a serious problem for the industry and one which it is almost impossible to guard against, he went on. On the Report of the Monopolies Commission on the cable industry, he considers that, if adopted en bloc, the recommendations could seriously disturb the stability of the industry as a whole and would most certainly prove detrimental to the national interest. (General Cable claim to be the largest independent manufacturers of rubber cables.)

India Rubber, Gutta Percha and Telegraph Works Co.

A small reduction in the net profit for the year ended September 30 last is shown in the preliminary statement. The figure is £140,665, which is £43,415 below that of the previous year, although taxation charged is £17,355 higher. The Ordinary dividend is again 9%.

Lindley Thompson Transformer (Holdings)

In our notes last week it was stated that sums of £15,000, £3,000 and £4,000 had been placed to factory extensions, plant and machinery, and to deferred repairs, respectively. In fact, these three amounts have been transferred to the capital reserve.

Marco Refrigerators Ltd.

The cumulative effect of purchase tax and credit restriction on the home market coupled with the shrinkage of export outlets was to reduce output during the year to September 30 last to a point where the manufacture of household refrigerators became uneconomic, Mr. A. E. Leach, the chairman, states. Organised efforts are being made on behalf of the industry to persuade the Government of the necessity of removing or at least substantially reducing purchase tax and of permitting and encouraging the sale of a higher percentage of the industry's products on the home market. The company has put into operation measures of diversification and rationalisation of production, and these should show results in mitigating the effects of the prevailing adverse conditions, but only early action by the Government can enable the company to reap full benefit, he says. Current assets are listed at £188,562 (*£213,530*). Current liabilities amount to £123,563 (*£123,401*).

Year to Sep. 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	87,397	38,792	67	30	18/9	13/6
1949	74,806	30,674	49	30	15/9	11/1
1950	40,187	14,763	20	17½	12/9	7/-
1951	36,569	11,401	15	7½	12/-	5/-
1952	-6,819*	-14,054*	—	—	5/-	2/6

* Loss.

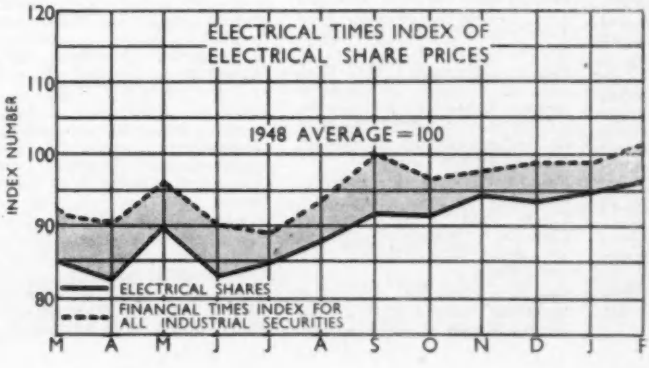
Superheater Co.

It is proposed to issue to shareholders "A" Ordinary 5/- shares in the proportion of one new share for every six held, whether Ordinary "A", Ordinary, or partly of both. A meeting is called for March 12. The issue will require 176,400 "A" Ordinary shares.

Dividends Declared

Aberdare Cables (Holdings) Ltd. Second interim of 15% (*10%*), which is to be considered as the final. The total for the year is 25% (*20%*).

Morgan Crucible Co. Interim of 3¾% (*same*).



During the first month of **1953** *both share price indices rose and for the first time for over* **12** *months that for all industrial shares topped the* **1948** *average. The "Financial Times" index for these securities rose by* **2·6** *to* **101·2**. *Though not as steep, the "Electrical Times" index for all electrical shares rose during January from* **94·5** *to* **96·1**. *These figures are based on the average prices ruling in* **1948**

Commercial Information

CONTRACTS OPEN

HOME

Feb. 7.—Lichfield. Rewiring public library and museum. Leslie Straw, city engineer and surveyor, Guildhall.

Feb. 7.—Mitcham T.C. Electric lamps included in list of supplies wanted during year beginning April 1. Borough Engineer and Surveyor, Town Hall.

Feb. 7.—Newburn (Northumb.) U.D.C. Electrical installation in 130 houses on West Denton estate. Surveyor is J. A. Weatherley.

Feb. 7.—Swansea T.C. Supply of electric lamps for public lighting for 12 months from April 1. Borough Engineer and Surveyor, Guildhall.

Feb. 9.—Buckinghamshire. Applications invited for inclusion on list of contractors, from those not already on the list, in respect of heating and ventilating installations, and electrical work. Names to County Architect, County Offices, Aylesbury.

Feb. 9.—Preston T.C. Electrical installation at Larches Hostel. Borough Engineer and Surveyor. Deposit £1.

Feb. 9.—Stepney B.C. Installation of lighting and power points and two lifts in 56 flats and 8 shops on Bancroft Rd. estate. Borough Engineer and Surveyor, 227-233 Commercial Rd., E.1. Deposit (in case of lighting and power points) £5.

Feb. 10.—Portsmouth. Supply and fixing of 56 flasher units and illuminated beacons at zebra crossings. City Engineer, 1 Clarence Parade. Deposit £2 2s.

Feb. 10.—Shoreham-by-Sea U.D.C. Provision and erection of 71 concrete columns, sodium lanterns and auxiliary equipment for street lighting in Old Shoreham and Brighton Rds. Engineer and surveyor, J. Dunn, 31 John St. Deposit £2 2s.

Feb. 12.—Co. Down. Electrical installation in kitchen at Abercorn primary school. A. N. Irens, consulting engineer, Bennett Building, 46 Donegall St., Belfast. Deposit £3 3s.

Feb. 13.—Huddersfield T.C. Supplies of tungsten filament, mercury and sodium lamps and cable required during year ending March 31, 1954. Borough Engineer and Surveyor, High St. Buildings.

Feb. 14.—Fife. Electrical work in erection of police station and houses at Cowdenbeath. Wilkinson and Lowe, quantity surveyors, 2a Chalmers St., Dunfermline.

Feb. 14.—Harrogate T.C. Supply of electric lamps required during year from April 1. L. H. Clarke, Borough Engineer and Surveyor, Municipal Offices.

Feb. 16.—Blackpool T.C. Supply of mercury arc rectifier, transformer and switchgear equipment. Documents from General Manager, Corporation Transport, Blundell Street.

Feb. 16.—Cookstown (N.I.) U.D.C. Electrical installation in new town hall. Documents from A. Montgomery, Town Clerk, Council Office, Molesworth St. Deposit £5.

Feb. 16.—Manchester. Rewiring and additions to electrical installations at Buglawton Hall special school, near Congleton. City Architect, Town Hall. Deposit £1 1s. (See Jan. 15 issue.)

Feb. 16.—Salford. Electrical installation at Frederick Rd. Depot of City Transport in preparation for conversion of supply from a.c. to d.c. Full details from General Manager and Engineer, Salford City Transport, Frederick Rd., quoting ref. E.I.

Feb. 17.—Horwich U.D.C. Supplies of tungsten and sodium lamps required during 12 months ending Mar. 31, 1954. Tenders to T. Roscoe, clerk of council, Council Offices.

Feb. 17.—Kildare. Electrical installation at St. Raphael's, Oakley Park, Celbridge. J. C. Costello, consulting engineer, 21 Leeson Park, Dublin. Deposit £5 5s.

Feb. 17.—Poole T.C. Following materials wanted during year ending March 31, 1954: cables, conduit wiring accessories, lamps, water heaters, street lighting lanterns and concrete columns. J.R. Barron, Borough Engineer and Surveyor, Municipal Buildings.

Feb. 18.—Derbyshire. Supplies required during year beginning April 1 include electric cables, conduit, lamps and accessories. Applications by Feb. 7 to County Architect, St. Mary's Gate, Derby.

Feb. 18.—Norwich. Supply and installation of 106 concrete columns, lanterns and ancillary works for street lighting on North Park Ave. estate. 55 of lanterns for 100 W tungsten lamps and 51 for 45 W sodium lamps. City Engineer's Office, City Hall. Deposit £2 2s. (See Jan. 29. issue.)

Feb. 18.—Wandsworth B.C. Application invited for names of contractors to be placed on Council's list for works up to and over £500. Documents from Borough Engineer, Municipal Buildings, S.W.18. (See Jan. 22 issue.)

Feb. 20—Cleethorpes T.C. Installation of new fluorescent lighting and lighting effects system (including stage lighting) in Pier Pavilion. Details from Publicity Manager, "The Knoll," Knoll St. (Advertised in this issue.)

Feb. 21.—Manchester. Installation of two electric passenger lifts at Openshaw College for Further Education. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Feb. 23.—Tynemouth. Electric lamps and cable, lamp columns and reflectors required during year ending Mar. 31, 1954. Borough Surveyor, D. M. O'Herlihy, 16 Northumberland Sq., North Shields.

Feb. 23.—West Riding. Conversion from gas to electrical installation at Selby county senior and J.M. school in Flaxley Rd., Selby. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £2 2s. (Advertised in this issue.)

Feb. 24.—Bedlington U.D.C. Housing materials required include electrical goods and cable requirements. Engineer and Surveyor, Council Offices, Front Street.

Feb. 26.—Dewsbury T.C. Supply of various street lighting equipment, including lanterns, lamps, cables, brackets, control gear, columns. C. H. Midson, Street Lighting Engineer, 27 Battye Street. (See Jan. 22).

Feb. 28.—Wexford. Supply and installation of electrically driven pumping plant and equipment for Edenvale pumping station. Consulting Engineers, Delap and Waller, 63 Lower Baggot St., Dublin. Deposit £5 5s.

Mar. 2.—Manchester. Rewiring and additions to electrical installation at Gt. Moreton Hall, Astbury. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Mar. 4.—Manchester. Supply and erection of four centrifugal pumps with electric motors, automatic switch and control gear, etc., for Poundswick B Booster station. Secretary, Waterworks Offices. Town Hall, Deposit £1 1s.

Mar. 7.—Wexford. Supply and erection of fully equipped electrically driven centrifugal pumping plant and water treatment plant at Taghmon. T. J. O'Connor, consulting engineer, Commercial Bldgs., Dame St., Dublin. Deposit £5 5s.

Mar. 9.—Eton R.D.C. Manufacture and installation of seven sets of electrically driven vertical unchokable sewage pumps with ancillary equipment, for three stations in Denham drainage scheme. Consulting Engineers, John Taylor and Sons, Artillery House, Artillery Row, Westminster. Deposit £5.

Mar. 10.—Thurles U.D.C. Supply and installation of duplicate electrically driven pumping plant at Lady's Well. Nicholas O'Dwyer, Consulting Engineer, 6 Burlington Rd., Dublin. Deposit £5 5s.

Mar. 12.—Birmingham. Lighting and power installations for new washing baths in Heath St., Winson Green. Applications to General Manager of Baths Dept., Kent St., Birmingham 5, by Feb. 10. Deposit £2 2s.

Mar. 18.—Galway. Electrical installation at fire station at Carryglass. J. C. Costello, consulting engineer, 21 Leeson Park, Dublin. Deposit £5 5s.

No date stated.—Jarrow T.C. Applications invited from suppliers of electrical materials and contractors to be placed on list to whom invitations to tender will be issued during year ending March 31, 1954. Borough Engineer, Town Hall.

No date stated.—N. of Scotland H.E. Board. Erection of 132 kV line between Brechin—Bridge of Dun. Applications to Kennedy and Donkin, Alliance House, 12 Caxton St., London S.W.1. Deposit £2 2s.

No date stated.—Bristol. Contractors willing to supply lamps and other electrical materials during 12 months ending March 31, 1954, to Hortham-Brentry Hospital Group Management Committee, are invited to submit names to J. Fellows, secretary, 11 Regent St., Clifton.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horse Guards Avenue, S.W.1, quoting reference.*

Feb. 16.—India. Director-General, Supplies and Disposals, Shahjahan Rd., New Delhi, requires 816 iron-clad lead acid cells for train lighting, 150 A.H. capacity.

Feb. 23.—India. Govt. of Travancore - Cochin requires supply of mercury traffic junction lanterns with choke, condenser etc., 250 W, 125 W and 80 W lamps and spares. B.o.T. (Ref: CRE 3143/53).*

Feb. 24.—New Zealand. Supply of one electric motor-driven oil pump unit capable of delivering two pints oil in four mins. at pressure of 0 to 3,000 lb per sq in. Motor suitable for 230 V single-phase, a.c. supply. Stores Manager, Min. of Works, Wellington. B.o.T. (Ref: CRE 3443/53).*

Feb. 28.—India. Supply of considerable quantities of iron-clad cut-outs, outdoor fuse units and neutral link boxes for Govt. of Travancore - Cochin. B.o.T. (Ref: CRE 3144/53).*

Mar. 3.—Uruguay. Supply of some 455,285 metres of lead-covered cable of various types and capacities required by Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE 2716/53).*

Mar. 12.—Australia. Supply of considerable quantities of l.v. high rupturing capacity fuse cartridges, carriers and bases, for Sydney County Council, Queen Victoria Building, George St., Sydney. B.o.T. (Ref.: CRE 1789/53).*

April 16.—New Zealand. Manufacture and supply of 900 suspension insulator assemblies; 150 double strain insulator assemblies, and 80 jumper insulator assemblies for 220 kV transmission line. State Hydro-Electric Dept., Wellington. B.o.T. (Ref: CRE 3264/53).*

April 22.—New Zealand. Manufacture and supply of about 150 miles of steel cored aluminium transmission line conductor with various accessories. State Hydro-Electric Dept., Wellington. B.o.T. (Ref: CRE 3262/53)*.

CONTRACTS PLACED

B.E.A. Four 550,000 lb/hr boilers, John Thompson Water Tube Boilers, Ltd., and 3,300 V

Your Queries Answered

"Aerovox" fluorescent accessories, makers of? R.B.—Aerovox Corpn., Washington St., Brooklyn, N.Y. (24891)

"Hamilair" heating equipment, makers of? L.B.—Hale, Hamilton and Co., Ltd., 107 Old Broad St., London E.C.2. (24909)

"Regal" vibrator, agents for? S.W.—L. G. Hawkins and Co., Ltd., 30-35 Drury Lane, W.C.2. (24916)

"Bell" fires, makers of? H.U.—A. Bell and Co., Gold St. Works, Northampton. (24927)

"Cheeto" food mixers, suppliers of? A.M.—Sloan Electrical Co., Ltd., 31-33 Bondway, Vauxhall, S.W.8. (24936)

"Regal" shavers, makers of? B.C.—These were of American manufacturer, the suppliers being Pontings, Kensington High St., W.8. (24942)

"Merlin" washing machines, suppliers of? J.R.—Witlor Ltd., 132 Lancaster St., Birmingham 4. (24951)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Sector" radiator, makers of? M.N. (24958)

switchgear and accessories, at Marchwood; English Electric Co., Ltd., coal handling plant at Goldington, International Combustion, Ltd.; high pressure piping equipment at Tilbury, John Thompson Water Tube Boilers, Ltd.; one 60,000 kW turbo-generator, British Thompson-Houston Co., Ltd., condensing and feed heating plant for one 60,000 kW turbo-generator, Hick Hargreaves and Co., Ltd., 3,300 V and 415 V switchgear and accessories, A. Reyrolle and Co., Ltd., and 2,500 MVA 132 kV switchgear at Meaford, General Electric Co., Ltd.; main and auxiliary cables and connections at Uskmouth, Pirelli-General Cable Works, Ltd.; two 30,000 kW turbo-generator sets at Bold, Metropolitan-Vickers Electrical Co., Ltd.; high pressure pipework and valves at Ince, Babcock and Wilcox, Ltd.; 3,300 V switchgear at Keadby, English Electric Co., Ltd.; ash handling transporter at Stella North, Strachen and Henshaw, Ltd.; 3,300 and 415 V switchgear and accessories, A. Reyrolle and Co., Ltd., and ash handling transporter at Stella South, Strachen and Henshaw, Ltd., and condensing and feed heating and evaporating plant at Clyde's Mill, Mirrlees Watson Co., Ltd.

Bexley T.C. Electrical work on Bristow Rd. estate, Norwood Electrical Co. Ltd., £1,447.

Birmingham. Electrical installation at Oldknave Rd. school, S. N. Watkins, Ltd.

Bradford. Electrical installation in 232 houses and flats on Buttershaw estate, Shann and Bell Ltd., £6,347.

Carlisle. Electrical installation in part of General Hospital, G. Bowman Ltd., £3,948.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	94½-95	112 0 0
,, ,, ,, "English" quality ...	96½-96¾	
TIN (99—99·76%) ... (Cash)	973-975	—
,, (3 months)	951-953	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	82½-83	96 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	52 0 0	—
Mild Steel Tape (0·04 in.)	39 15 0	—

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Ashavin. 713,035. Class 9. Cables. Shardlow Electric Wires Ltd., Moseley Buildings, 56 Moseley St., Manchester.

Cathomag. Electric lamps. De Vere (Kensington) Ltd., 83 Bellendon Rd., S.E.15.

Celsonic. 713,253. Class 9. Sound recording apparatus, microphones etc. Excel Sound Services Ltd., Norwood Works, off Norwood Ave., Shipley, Yorks.

Cerelite. 712,801. Class 11. Carbons for electrical purposes. Charles H. Champion and Co. Ltd., National House, 60-66 Wardour St., London W.1.

Chesmet. 712,883. Class 9. Electric batteries and safety fuses. Diamond Distributors (Cheshunt), 193 Windmill Lane, Cheshunt, Herts.

Percon. 713,130. Class 11. Lighting fittings. Hartley Electromotives Ltd., 1a Harrington Rd., S.W.7.

Telstor. 712,659. Class 9. Electronically operated level indicators. Fielden (Electronics) Ltd., Paston Rd., Wythenshawe, Manchester.

TRADE NOTES

Changes of Address. The executive and office staff of Cimex-Fraser Tuson Ltd. are now at Cray Ave., Orpington, Kent (Tel.: Orpington 6731), where additional new factory and office premises have been completed.

The Leeds branch office of the British Aluminium Co., Ltd., has been transferred to Martins Bank Chambers, Vicar Lane, Leeds 1. Mr. A. E. Heeley continues as branch manager, and the telephone number remains Leeds 28343.

The Commercial Group of Mullard's Equipment Division have moved to 6 Gate Street, Lincoln's Inn Fields, W.C.2. The general manager of the Division, Mr. J. P. Jeffcock, and his immediate staff remain at Century House, Shaftesbury Ave., W.C.2, where all correspondence should be sent.

London Office. The Aberdare Electric Co., Ltd. (of Dublin), has opened an office at 36 Victoria St., London S.W.1. Tel.: Abbey 1060. The office, which is under the management of Mr. E. C. Green, is solely for the sale of Thermodare storage space heaters.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Guy R. Fountain Ltd. First dividends of 4s. in £ payable at Saker and Davis, 58 Theobalds Rd., London W.C.1, on Mar. 3.

Altass Electric Co. Ltd. N. W. Osborne, 11-12 Finsbury Sq., London E.C.2, has been appointed liquidator together with committee of inspection.

BANKRUPTCY ACTS

Intended Dividends

Macclesfield. Thomas Riley, electrical contractor trading at 58 Station Rd., Tunstall. Last day for receiving proofs, Feb. 11. Trustee is F. C. Ormrod, Official Receiver, 12 Lonsdale Rd., Stoke-on-Trent.

Order Rescinded

Barnsley. Sidney E. Jones and George W. A. E. Short, trading as S. E. Jones and Co., dry battery manufacturers at Elsecar Receiving order made on Jan. 25 1928, rescinded. Grounds named, debts paid in full.

First Meeting

Birmingham. Andrew Craig, electrical and plating plant engineer, 211 Farm St., Hockley. Meeting at Official Receiver's Office, Somerset House, 37 Temple St., Birmingham, on Feb. 9 at 11.15 a.m. Public examination at Court House, Corporation St., Birmingham, on Mar. 25 at 10.15 a.m.

Dividends

Croydon. Douglas Cromwell and Valerie S. Cromwell, manufacturers of electrical fittings, etc., trading as Cromwell and Co., at 76 High St., and at Coombe Ave., Croydon. First and final dividends of 1s. 8d., payable at 32 Queen Anne St., London W.1, on Feb. 24.

BUSINESS PROSPECTS

HOME

Altrincham T.C. It is proposed to build 125 dwellings on various sites.

Ashton-in-Makerfield U.D.C. Approval received for erection of 102 houses on Landgate Lane site.

Ayr. This year's building programme provides for erection of total of 450 houses. Largest groups are 48 at New Cumnock and 46 at Auchinleck.

Battle R.D.C. It is proposed to build 70 houses at Aston Fields.

Belfast. Central Chest Clinic in Durham St. is to be extended at cost of £61,000.

Burton-on-Trent T.C. Tenders will probably be invited soon for erection of grammar school at Mill Hill Lane at estimated cost of £186,013.

Chester-le-Street R.D.C. Proposals submitted for 60 houses and flats at Kibblesworth, and 13 dwellings and a shop at Bournmoor.

Chingford T.C. 120 houses to be built on Yardley Lane North estate.

Clackmannan. Preliminary plans approved for erection of £200,000 academy at Alloa. Also, Dean of Guild Court has approved erection of further 84 houses in Tullibody Rd., Alloa.

Corby U.D.C. Erection of 613 dwellings under seven contracts in 1953 housing programme. G. B. Blackall, Clerk of Council, Council Offices.

Croydon. Tenders to be invited soon for stages 1 and 2 of £209,095 secondary mixed school, and for Langrane secondary school for boys.

Cupar T.C. Work is expected to begin this year on conversion from gas to electricity of 175 houses. Estimated cost of scheme is £5,000.

Flintshire. Erection of junior and infants' school at Broughton. W. Griffiths, county architect, Llwynegrin, Mold.

Glendale (Northumb.) R.D.C. Approval granted for 70 houses at Wooler.

Harlow (Essex). Sketch plans approved for two primary schools at Little Parndon and Hare St. (£91,035 and £91,175), and similar schools at Mark Hill (£90,905) and Polter St. (£90,905).

Isleworth (Middlx). N.W. Metropolitan Hospital Board has approved conversion from d.c. to a.c. at West Middlesex Hospital.

Kidsgrove U.D.C. Approval sought for 214 dwellings on Rookery estate.

Largs (Ayr) T.C. to build 145 houses in district.

Leyton. Secondary school costing £90,000 is to be built in Buckholt Road.

Llandilo U.D.C. Erection of 32 houses at Hesl-y-Carreglas. Architect is W. S. P. Cottrell, 8 Quay St., Carmarthen.

Loughborough T.C. Plans prepared for 272 houses on two sites.

Lowestoft T.C. Erection of 32 houses on Whitton estate. Borough Engineer's Office, 49 High St.

Manchester. Benjamin Waterhouse are architects for rebuilding of Marshall and Snelgrove's building in St. Ann St.

Newcastle-on-Tyne. Negotiations proceeding for erection of 700 houses on Montagu estate.

Southborough U.D.C. Erection of 44 houses on Speldhurst Rd. site. Architects are Howes and Jackman, 1 Verulam Buildings, Grays Inn, London, W.C.1.

South Shields T.C. Extensions costing £3,000 proposed to Majestic Ballroom. Architects are Page, Son and Hill, 75 King Street.

Southwell (Notts.). N.C.B. Housing Assoc. is to build 480 houses for miners in four groups.

Stockton-on-Tees T.C. Layout plans approved for 106 houses and 81 flats at Wrens Mill.

Sunderland. N.E. Trading Estates Ltd. to build a factory on Pallion Trading estate for Bristol Aeroplane Co. Ltd.

Swansea T.C. It is proposed to erect 120 houses and 48 flats at West Cross, 205 houses at Cadle, 100 at Trallwyn, 126 at Clase and 56 flats at Penlan.

Tynemouth T.C. Work expected to start in autumn in £84,000 Monkhouse primary school. Borough Engineer, 16 Northumberland Sq., North Shields.

Wakefield R.D.C. Application to be made for sanction to borrow £136,225 for erection of 106 dwellings on six sites.

Walsall T.C. Application for sanction to borrow £126,500 to be made for second instalment of Walsall and Staffs Technical College.

Walthamstow T.C. Quantity surveyors for erection of 60 flats at The Drive are C. E. Ball and Partners, Dilke House, Malet St., W.C.1.

West Hartlepool. Some £470 is to be spent improving lighting at Technical College and Elwick Road school.

Whitehaven. Factory additions proposed by Marchon Products Ltd.

Wigston (Leics.) U.D.C. It is proposed to build 119 houses during 1953.

Windsor. Second instalment of E. Berks College of Further Education will probably be included in 1954-55 programme. First instalment (£40,000) is to be carried out this year.

OVERSEAS

India. Mr. S. C. Dutt of Service Batteries Ltd., Calcutta, is interested in importing glass wool and separators for batteries and machinery for their manufacture. He is now at 2 Frognal Lane, London.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 113 Chancery Lane, London W.C.2.

Bloo-Bar Products Ltd., Electricians, electrical and mechanical engineers, etc. Cap.: £100. L. Bloom, Tiverton Lodge, Tetlow Lane, Salford, 7, signs as director.

T. Bridger & Son Ltd., 168 High St., Slough, Bucks. Manufacturers of and dealers in dynamos, magnetos, batteries, etc. Cap.: £5,000. Dirs.: H. E. Bridger and Mrs. A. Bridger, E. G. Waters and R. J. R. Allnutt.

Delta Electric Ltd., manufacturers of and dealers in engineering and electrical apparatus, appliances and machinery, etc. Cap.: £1,000. Dirs.: To be appointed by subs. Subs.: C. W. Cooper, 3 Oak Rd., Bedford, and J. R. Slatter Brolades, Stagsden Rd., Bromham, Beds.

Ealing T.C. Scheme in hand for building 290 houses on Northolt Park estate.

Rodd O'Neill Engineering Co., Ltd., 78 Old Broad St., E.C.2. Mechanical and electrical engineers, metal platers, etc. Cap.: £5,000. Dirs.: To be appointed by subs. Subs.: R. J. Rodd and Mrs. S. M. Rodd, Porthcothan, Hampton Court Way, Thames Ditton.

MEETINGS TO NOTE

THURSDAY, FEB. 5

BRITISH INSTN. OF RADIO ENGRS. (Scottish).—"Electronic Computing Machines." B. V. Bowden. The University, Edinburgh.

BRITISH INSTN. OF RADIO ENGRS. (Merseyside).—"Port Radio-Telephone System." D. G. Holloway. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

INCORP. PLANT ENGRS. (Peterboro').—"Processed Steam." E. S. Chandler. Gas Board, Church St., 7.30 p.m.

I.E.S. (Glasgow Centre).—Annual meeting. "Luminescence as applied to Lighting." H. G. Jenkins and A. H. McKeag. 39 Elmbank Cres., 6.30 p.m.

I.E.S. (Nottingham Centre).—"New Lamps, New Uses and New Lighting Techniques." H. R. Ruff. Elect. Offices, Smithy Row, 6 p.m.

I.E.S. (Exeter Group).—"Fluorescent Street Lighting—First Five Years." H. E. G. Watts. Providence Hall, Northernhay St., 7 p.m.

I.E.E. (London).—"Electrification of Estrada de Ferro Santos a Jundiai (Sao Paulo Railway)." R. J. B. Chatterton and D. H. Rooney. Savoy Place, W.C.2, 5.30 p.m.

A.S.E.E. (S. London Branch).—"Flame-proof Motors." A. N. D. Kerr. Cafe Royal, Croydon, 8 p.m.

FRIDAY, FEB. 6

I.E.S. (Bath and Bristol Centre).—"Fluorescent Street Lighting—First Five Years." H. E. G. Watts. Elect. Board, Old Bridge, Bath, 7 p.m.

I.E.S. (Huddersfield Group).—"Sodium Lamps and their Applications." A. W. Gostt. Elect. Showroom, Market St., Huddersfield, 7.15 p.m.

I.E.E. (S. Midland Centre).—Annual dinner at Grand Hotel, Birmingham, 6.30 p.m.

MONDAY, FEB. 9

LEICESTER ELECTRICAL SOC.—"Development and Use of Aluminium Sheathed Cables." H. M. Fricke. Elect. Offices, Charles St., 7 p.m.

I.E.S. (Sheffield Centre).—"Specification and Testing of Fluorescent Lamps." W. R. Bloxsidge. University, Western Bank, 6.30 p.m.

I.E.E. (London).—Discussion on "Is Technical Advertising Necessary or Desirable?" W. Bamford. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.E. Centre).—"Use of Electricity in Modern Iron and Steel Works." W. F. Cartwright. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation Groups).—"Design of High-Speed Salient-pole a.c. Generators for Water-Power Plants." E. M. Johnson and C. P. Holder. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western Centre).—"Characteristics and Control of Rectifier-Motor Variable-Speed Drives." P. Bingley. Tech. College, Bath, 6 p.m.

A.S.E.E. (Central London Branch).—"Corrosion and Cathode Protection." G. G. Portch. St. Ermin's Hotel, Caxton St., S.W.1, 6.45 p.m.

A.S.E.E. (N.W. London Branch).—"Brains Trust" at Prince of Wales Hotel, Kingsbury, 8 p.m.

TUESDAY, FEB. 10

NEWPORT ELECTRIC CLUB.—"Electricity applied to Agriculture and Horticulture." L. T. Lowe. Tredegar Arms Hotel, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (South West).—"Automatic Controls for Heating Equipment." K. Ernest. G.E.C., Cathays Park, Cardiff, 6.30 p.m.

INCORP. PLANT ENGRS. (E. Lancs.).—"Instrumentation and Automatic Control for Medium and Small Boilers." Mr. Klepp. Engineers Club, Albert Sq., Manchester, 7.15 p.m.

I.E.S. (London).—"Shop Window Lighting." A. W. Jarvis. 2 Savoy Hill, W.C.2, 6 p.m.

I.E.E. and INSTN. OF MECHANICAL ENGRS.—"Ignition Interference with TV Reception." A. H. Ball and W. Nethercott. Storey's Gate, S.W.1, 5.30 p.m.

I.E.E. (N.W. Supply Group).—"Researches on Circuit-Breaking by h.v. Circuit-Breakers." A. F. B. Young. Engineers Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (N. Ireland Centre).—"275 kV Developments on British Grid System." D. P. Sayers, J. S. Forrest and F. J. Lane. Presbyterian Hostel, Howard St., Belfast, 6.15 p.m.

A.S.E.E. (Bolton Branch).—Lecture at Balmoral Hotel, Bradshawgate, 7.30 p.m.

WEDNESDAY, FEB. 11

BRITISH INSTN. OF RADIO ENGRS. (London).—"Modern Trends in Communications Materials." L. A. Thomas. School of Hygiene, Keppel St., 6.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (North-East).—"Design of Commercial F.M. Receiver." F. H. Beaumont. Neville Hall, Westgate Rd., Newcastle, 6 p.m.

INST. OF EXEC. ENGRS. AND OFFICERS.—"Inter-dependence of Administrative, Executive and Technical Staff." J. A. Trott. Imperial Hotel, Birmingham, 7.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—Annual dinner at Savoy Hotel, 7.15 p.m.

INCORP. PLANT ENGRS. (E. Midlands).—"An Approach to Maintenance." H. G. Hilton. Welbeck Hotel Nottingham, 7 p.m.

I.E.E. (Radio Section).—"Method of Designing Transistor Trigger Circuits." Prof. F. C. Williams and G. B. B. Chaplin. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs. Sub-centre).—Discussion on "Electric Traction, especially single-phase Working." H. Charnley. Harris Inst., Corporation Rd., Preston, 7 p.m.

I.E.E. (N. Scotland Sub-centre).—"Design and Testing of High-Power Valves." A. M. Hardie. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern Centre).—"Earthing." P. W. Cave. Elect. Board Offices, Hove, 6.30 p.m.

I.E.E. (Oxford). "Colour TV." G. G. Gouriet. Elect. Board Offices, George St., 7 p.m.

A.S.E.E. (Bradford Branch).—"Factory Maintenance." J. W. White. Midland Hotel, 7.30 p.m.

A.S.E.E. (Preston Branch).—"Aluminium Cables." F. T. Aldridge. Bull and Royal Hotel, 7.30 p.m.

THURSDAY, FEB. 12

E.P.E.A. (Merseyside Tech. Group).—"Earthing of Electrical Systems and Equipment." F. Mather. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

I.E.S. (Manchester Centre).—"Lamps and Lighting for Inspection," H. R. Ruff and H. E. Bellchambers. Elect. Board, Town Hall Extension, 6 p.m.

I.E.E. (N.E. Centre).—Annual dinner and dance at Old Assembly Rooms, Newcastle, 7.30 p.m.

I.E.E. (N. Scotland sub-centre).—"Design and Testing of High-Power Valves." A. M. Hardie. Royal Hotel, Dundee, 7 p.m.

I.E.E. (Swansea sub-centre).—Discussion on "Earthing." R. B. Rowson, J. Wright, and N. C. De Jong. Central Public Library, 6 p.m.

FRIDAY, FEB. 13

E.I.B.A. (Birmingham).—Annual ball at Tube Investments social club.

A.S.E.E. (Crewe Branch).—"A.C. Motors and Control Gear." T. C. Riches. Copeland Arms Hotel, Glebe St., Stoke, 7.30 p.m.

A.S.E.E. (Liverpool Branch).—"Electronics in Industry" with film. Mr. Hickman. Elec. Showroom, Whitechapel, 7.30 p.m.

E.P.E.A. (S. Meter Engrs. Group).—"Testing of kWh Meters with Electrically Driven Stroboscope and Counters." A. G. Baggott. Caxton Hall, Westminster, 6.30 p.m.

MONDAY, FEB. 16

BIRMINGHAM ELECTRIC CLUB.—"Progress in Application of Heat Pump in G.B." Miss M. V. Griffith. Midland Hotel.

I. E. E. (Mersey and N. Wales Centre).—"Toughened Glass Power Line Insulator." E. F. Johnston. Liverpool Royal Instn., Colquitt St., Liverpool, 6.30 p.m.

I.E.E. (N.E. Radio and Measurements Group). — "Moving-Coil Relay Applied to Modern High-Speed Protective Systems." C. Ryder, J. Rushton, and F. M. Pearce. King's College, Newcastle, 6.15 p.m.

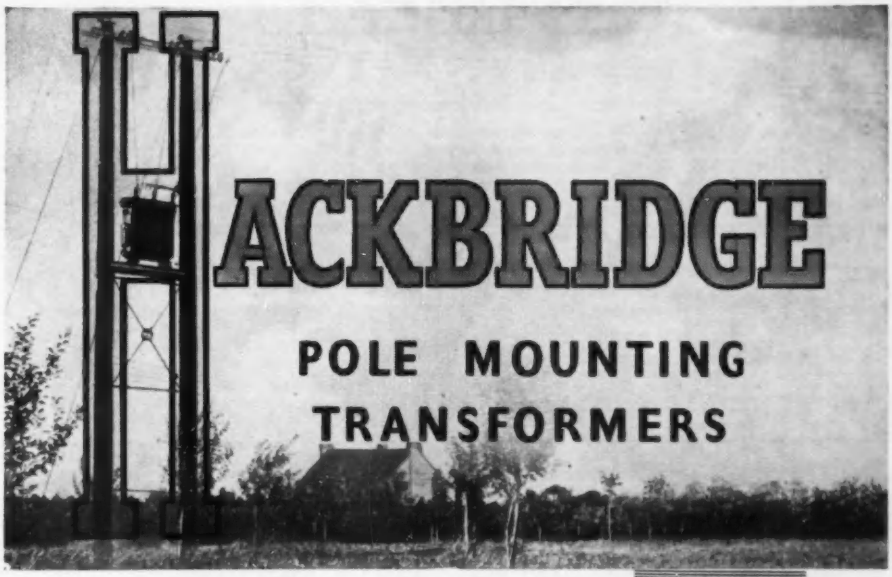
I.E.E. (Western Supply Group).—Informal Papers. Elect. House, Colston Ave., Bristol, 6 p.m.

EXHIBITION DIARY

Hotel and Catering. Opened at City Hall, Deansgate, Manchester, on Feb. 4, continuing until Feb. 14.

Inventions and New Ideas. Opens on Feb. 18 at Central Hall, Westminster. Closes on Feb. 28.

Daily Mail Ideal Home. Opens on Mar. 3 at Olympia, London, and continues until Mar. 28.



HACKBRIDGE pole mounting transformers are used extensively in many of the world's largest distribution systems and the outstanding performance of the many thousands of these units installed during a period of over 25 years emphasises the supreme reliability of Hackbridge Transformers for this type of service.

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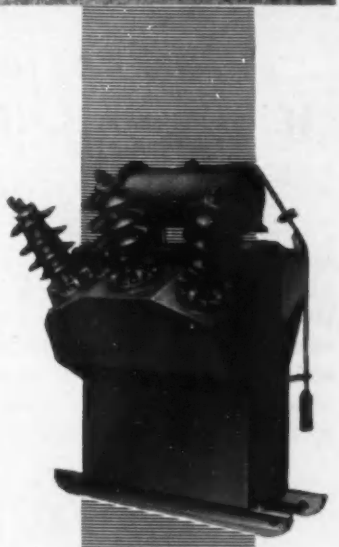


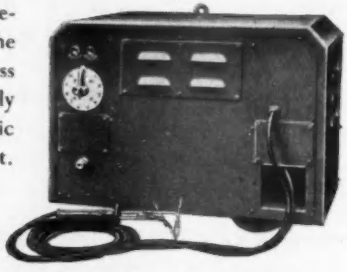
RIGHT: A 50 kVA 33/11 kV. three phase Hackbridge transformer for pole platform mounting.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric, Walton-on-Thames"

. . . just the job for M-V Atomic Hydrogen welding equipment

Broken shanks of drills and reamers, fractured collets and a whole host of other workshop production tools can be repaired with M-V atomic hydrogen welding equipment. The same equipment is also used for the manufacture of press tools, by depositing tool steel on mild steel blanks exactly where required. Full technical details of the M-V atomic hydrogen welder and its applications are available on request.

Metrovick Atomic Hydrogen Welding Equipment, comprising 50 ampere Welding Set and Torch connected by cable and pipe.



METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, TRAFFORD PARK, MANCHESTER, 17
Member of the A.E.I. group of companies

METROVICK *Equipment for More Efficient Welding*

J/E004

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

BOROUGH OF CLEETHORPES

LIGHTING—PIER PAVILION

THE BOROUGH COUNCIL invite tenders for the INSTALLATION of a new lighting and lighting effects system (including stage lighting) in the Pier Pavilion, Cleethorpes.

Tenderers are requested to prepare their own schemes which must incorporate fluorescent lighting.

Permission to view the premises and any other information required may be obtained from the Publicity Manager, "The Knoll," Knoll Street, Cleethorpes.

Tenders in plain sealed envelopes endorsed "Tender—Pier Pavilion Lighting," must reach the undersigned not later than noon on Friday, February 20, 1953.

G. SUTCLIFFE,
Town Clerk.

Council House, Cleethorpes.
January 28, 1953. (C 533)

CITY OF MANCHESTER

THE EDUCATION COMMITTEE invite tenders for REWIRING and ADDITIONS to electrical installation at Great Moreton Hall, Astbury, near Congleton, Cheshire. Specification and drawings with tender form may be obtained from the City Architect, Town Hall. Deposit £1/1/- (returnable). Tenders sealed in endorsed envelopes, must be delivered before 10 a.m. on March 2, 1953.

PHILIP B. DINGLE,
Town Clerk.

January 30, 1953. (C 568)

CITY OF MANCHESTER

THE EDUCATION COMMITTEE invite tenders for the installation of two ELECTRIC PASSENGER LIFTS at the Openshaw College for Further Education, Whitworth Street, Openshaw, Manchester. Specification and drawings may be obtained from the City Architect, Town Hall. Deposit £1/1/- (returnable). Tenders, sealed in endorsed envelopes, must be delivered before 10 a.m., February 21, 1953.

PHILIP B. DINGLE,
Town Clerk.

January 30, 1953. (C 569)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the CONVERSION FROM GAS TO ELECTRICAL INSTALLATION at the Selby County Senior and J.M. School, Flaxley Road, Selby.

Specification with plans, together with conditions of tender, may be obtained on application to the County Architect, "Bishopgarth," Westfield Road, Wakefield, on payment of a deposit of £2/2/-, which will be returned on receipt of a bona-fide tender. Cheques must be made payable to the "West Riding Treasurer" and crossed "& Co."

Sealed tenders must be addressed to me, the undersigned, and received at Room A, County Hall, Wakefield, not later than 10 a.m. on Monday February 23, 1953.

BERNARD KENYON,
Clerk of the County Council.

January, 1953. (C 570)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

APPOINTMENTS VACANT

Employment of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

LITTLEBROOK Power Station—DEPUTY POWER STATION SUPERINTENDENT. Applicants should possess B.Sc. degree or should be corporate members of the Institution of Mechanical and/or Electrical Engineers, with extensive experience in the operation and maintenance of modern high-pressure turbine and boiler plant and E.H.T. switchgear. Experience in the administration of a large power station, together with initiative, good organising ability and experience in the control of labour essential. Class "M," Grade 3, £1,333 per annum.

Croydon "A" and "B" Power Stations—MAINTENANCE ENGINEER (MECHANICAL). Applicants should preferably possess B.Sc. degree or equivalent and must have had experience in the control of labour. Extensive experience in the maintenance of high-pressure turbine and boiler plant and power station auxiliaries essential. Class "K," Grade 6, £982/16/- per annum.

N.J.B. conditions of service for both positions. Salaries quoted include London Allowance. Applications on forms obtainable from Station Superintendents at either Croydon "B" Power Station, Beddington Farm Lane, Purley Way, Croydon, Surrey, or Littlebrook Power Station, nr. Dartford, Kent, should be received by the appropriate Station Superintendent not later than February 18, 1953.

(C 555)

KENT COUNTY COUNCIL

APPLICATIONS are invited for appointment in the Buildings Department of an ENGINEERING ASSISTANT (Electrical) at a salary, according to qualifications and experience, within A.P.T. Grades I to III (£465 to £570).

Applicants must be capable draughtsmen with practical experience in electrical installation work and should preferably be graduate members of the Institution of Electrical Engineers.

Applications, on forms obtainable from the County Architect, Springfield, Maidstone, must be delivered to him within fourteen days of the appearance of this advertisement.

W. L. PLATTS,
Clerk of the County Council.

County Hall, Maidstone.
January 28, 1953. (C 552)

THE JERSEY ELECTRICITY CO., LTD.

ACCOUNTANT

THIS POST is now vacant and applications are invited from qualified accountants with comprehensive experience in the electricity supply industry.

The Company sends out approximately 17,000 energy accounts each quarter in addition to a large number of merchandising accounts.

Applicants should previously have held a post of responsibility and be competent to take charge of the Accounts, Costs and Wages Offices, and to operate a system of budgetary control after initial instruction.

Commencing salary £866 per annum.

Applications should be endorsed "Accountant" and sent to the Engineer and Manager, 11 Broad Street, St. Helier, Jersey, C.I. (C 549)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments at the Northmet Sub-Area Headquarters, Southgate, London N.14.

ENGINEERING DRAUGHTSMAN (10/53 R)
Civil Engineering and Buildings

Candidates should have had the requisite training and experience to be able to prepare plans and detailed drawings of building and civil engineering works for substations, service centres, workshops and offices.

The salary will be in accordance with Grade 6, Schedule "D," of the National Joint Board Salary Agreement within a range of £458-£595 p.a., inclusive of London Allowance.

JUNIOR ENGINEERS (11/53 R)

Candidates should have had a sound technical training to Higher National Certificate standard or equivalent, and should preferably have had previous experience in the electricity supply industry. The duties will be of a general nature on operation and maintenance, planning and development, or construction, with opportunities for temporary secondment to district staff as required.

The salary will be in accordance with Class "N," Grades 22 to 18, of the National Joint Board Salary Agreement, within a range of £415-£571 p.a., inclusive of London Allowance, commencing at a point dependent upon the candidate's qualifications and experience.

Future salaries and conditions of service for the above appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London N.14, within 14 days of the appearance of this advertisement.

January 30, 1953. (C 554)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following superannuable appointments. Salary and conditions of service will be in accordance with the N.J.B. agreement:

(a) STATION SHIFT CONTROL/BOILER SHIFT CONTROL ENGINEERS
Peterborough Generating Station.
Salary, Class "F," Grade 10, £577-£598 per annum.

(b) STATION SHIFT CONTROL ENGINEER
Letchworth Generating Station.
Salary, Class "E," Grade 10, £555-£569 per annum.

Applicants should have reached the standard of the ordinary national certificate in electrical engineering, or its equivalent, and had experience in the operation of a switchboard at a generating station and be fully conversant with high voltage switching operations and protective systems.

In addition for (a) experience in the operation of pulverised fuel fired steam raising plant, and for (b) a knowledge of the operation of various types of d.c. converting plant will be an advantage.

The successful applicants for (a) will be required to interchange the duties of station shift control engineer and boiler shift control engineer.

Applications, stating age, qualifications and experience, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by February 21, 1953.

W. N. C. CLINCH,
Controller.
(C 537)

GOVERNMENT OF KUWAIT

A MECHANICAL ENGINEER required for service with the Government of Kuwait, Persian Gulf. Applicant must have extensive experience in organising general mechanical and electrical repair workshops. He will have to take charge of the machine, fitting and repair shops for all classes of mechanical and electrical machinery. He will also be expected to organise preventive maintenance programmes for large installations which will be installed in central kitchens, hotels, hospitals, etc., which have large air-conditioning, electrical and cooking equipments. Applicant should be a Corporate Member of the Institution of Mechanical Engineers.

The consolidated starting salary will be up to £2,400 per annum, according to experience. Free furnished quarters and free medical attention are provided. The first year will be probationary and home leave will be granted at the end of three years' service. Married accommodation cannot be promised during the first year of service.

Applications, stating age and giving full details of experience and qualifications, should be addressed to the Secretary, Ewbank and Partners Ltd., Engineering Consultants, 10-11 Grosvenor Place, London, S.W.1. (C 468)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following posts in this Division:—

ASSISTANT CHEMIST

Longford Power Station, Coventry. Vacancy No. 12/53

Applicants should have had practical experience in all branches of power station chemistry. Preference will be given to candidates possessing Higher National Certificate in chemistry or equivalent qualifications.

Salary for the above appointment will be within Class "G," Grade 9 (£641 to £667 per annum) of the N.J.B. Agreement.

Closing date for this appointment: February 20, 1953.

SHIFT CHARGE ENGINEER
Lincoln Power Station. Vacancy No. 16/53

Applicants should have had a sound technical training and considerable experience in a modern generating station. The possession of a Higher National Certificate in Mechanical or Electrical Engineering, or equivalent qualifications, will be advantageous.

The salary will be in accordance with Class "F," Grade 7 (£697 to £718 per annum) of the N.J.B. Agreement.

Closing date for this appointment: February 20, 1953.

The above posts will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than the dates stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
(C 550)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

No. 6 (Hull) Sub-Area
Goole District

FIRST ASSISTANT DISTRICT ENGINEER

Applicants should be experienced in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution networks, substation plant and ancillary apparatus.

The successful applicant will be responsible to the District Engineer and must be capable of preparing complete schemes and estimates. He will be required to reside in the Goole district and undertake standby duty.

Applicants should be corporate members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary: N.J.B. Class "D," Grade 5, £714-£731 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than February 19, 1953.

No. 7 (Grimsby) Sub-Area
Scunthorpe District

JUNIOR ENGINEER

Applicants should be graduate members of the Institution of Electrical Engineers or hold either the higher national certificate in electrical engineering or an equivalent qualification. They should have had training in the construction, operation and maintenance of h.v. and l.v. overhead and underground distribution systems.

Salary, N.J.B. Schedule "F," Grade 15/14, £390-£466 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than February 19, 1953. (C 535)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position. The successful applicant will be based at the Southern Sub-Area Drawing Office at Beckenham, Kent, but may be required to work in any district office within the sub-area.

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in sub-stations, layouts and site plans of mains work, electrical diagrams.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 6—£458 to £585 7s. per annum, inclusive of London allowance.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned by February 14, 1953. Please enclose addressed foolscap envelope and quote Ref. V/1488/T. on all correspondence.
(C 536)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Schedule "A".

STATION CHEMIST
Woolwich Generating Station

Applications from suitably qualified candidates are invited for the position of Station Chemist at Woolwich generating station, which operates at 400 and 600 psi pressure. Experience in analysis of oils, waters and fuels and ability to analyse other materials used in generating stations is highly desirable. Applicants should preferably be qualified with minimum of Higher National Certificate. Organising ability, personality and an interest in engineering matters will rank equally with technical ability. Salary, Class "G," Grade 7, £765 9/- p.a.

ASSISTANT ENGINEER (ELECTRICAL TESTING)
Fulham Generating Station

Applicants should have had an engineering apprenticeship followed by experience of electrical testing, preferably in a modern generating station. Technical education to Higher National Certificate standard, or above, an advantage. Salary, Class "L," Grade 12, £700 7/- p.a.

JUNIOR ENGINEER (OPERATION)
Brunswick Wharf Generating Station

Qualifications: Higher National Certificate in electrical or mechanical engineering. Experience of boiler or turbine operation, as position gives opportunity for supervision of running of turbines and P.F. boilers. Salary, Class "H," Grade 14, £524 p.a.

JUNIOR ENGINEER
Hackney Generating Station

Qualifications: Technical training preferably to Higher National Certificate standard. Generating station experience an advantage. Good opportunity for gaining further experience. Salary, Class "F," Grade 14, £476 p.a.

JUNIOR ENGINEER
Bow Generating Station

Qualifications: Sound technical training, with some subsequent drawing office experience. Ordinary National or Higher National Certificate in Mechanical or Electrical Engineering. Salary, Class "F," Grade 14, £476 p.a.

SHIFT CHARGE ENGINEER
Grove Road Generating Station

Qualifications: Preferably to Higher National Certificate. Experience in generating station operation. Salary, Class "F," Grade 7, £731 17/- p.a.

Applications will only be considered on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and returned within 14 days of this advertisement. (C 553)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(a) SHIFT CHARGE ENGINEER, Hayle Generating Station. N.J.B. "F.7," £697 to £718.

(b) SHIFT CHARGE ENGINEER, Newton Abbot Gen. Station. N.J.B. "F.7," £697 to £718.

(c) SHIFT CHARGE ENGINEER, Castle Meads Gen. Station (Gloucester). N.J.B. "E.7," £648 to £681.

(d) ASSISTANT SHIFT CHARGE ENGINEER, Hayle Gen. Station. N.J.B. "F.9," £607 to £629.

(e) GENERAL ASSISTANT ENGINEER, Technical Dept., Plymouth Region. N.J.B. "8AX CX," £501 to £875. Superannuation scheme.

Candidates for (a), (b) and (c) should have had considerable experience in a modern generating station. Graduate or Corporate Membership of a recognised engineering institution or equivalent desirable.

For (d), candidates should have had sound technical training and practical operating experience in a modern generating station.

For (e) candidates should possess technical qualifications leading to A.M.I.E.E. and have served in the works of one of the leading manufacturers of electrical equipment. Experience in high voltage insulation testing would be an advantage.

Application forms obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned by February 18, 1953. (C 551)

BRITISH ELECTRICITY AUTHORITY

South Western Division

JUNIOR ENGINEER (CONTROL) required at Hayle Generating Station.

Superannuation Scheme. Salary N.J.B. Class "F" Grade 15, commencing at £390.

Applicants should possess O.N.C. in Electrical or Mechanical Engineering or equivalent. Previous generating station experience considered an advantage.

Application forms obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned not later than February 14, 1953. (C 525)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

APPLICATIONS are invited from engineers qualified to fill the following posts :—

ASSISTANT GENERAL MANAGER
Head Office—Port of Spain

The successful candidate for the post must be a Chartered Electrical Engineer. Preference will be given to applicants who have had five years recent executive experience of steam generation, power station construction, distribution, and administration in a medium-sized electricity supply undertaking. Membership of the Institute of Mechanical or Civil Engineers or an Engineering degree from a recognised British University will be an additional qualification.

The salary for the post will be £1,775 to £1,887 10s. a year. A modern unfurnished house in a good residential area will be provided at a rent of £10 8s. 4d. a month. Heavy furniture can be provided at a small additional charge. A motor-car will be provided.

Other general conditions are stated at the end of this advertisement.

DEPUTY STATION SUPERINTENDENT
—Penal

The successful candidate for this post must have had extensive operating and maintenance experience in a medium-size power station using water-tube boilers and steam turbines. Knowledge of gas turbines would be an additional advantage. Preference will be given to Corporate Members of the Institution of Electrical or Mechanical Engineers. The yearly salary at the present size of the station is £1,050-1,125. Extensions already ordered, when completed, will bring the salary in the range £1,150-1,162 10s.

CHARGE ENGINEERS
—Penal

The successful candidates must have had considerable operating experience with water-tube boilers and steam turbines, preferably in medium-size electric generating stations. The yearly salary at the present size of the station is £850-925. Extensions already ordered, when commissioned, will increase the salary to the range £950-1,025.

Penal is in the south of Trinidad. Staff are provided with furnished modern house at 10%, of their salary a year. Heavy furniture can be provided at a small additional charge.

CONTROL AND ELECTRICAL ENGINEER
—Port of Spain Station

The successful candidate will be responsible to the Generation Superintendent for the control of the Commission's system consisting of two steam power stations and a number of small privately-owned diesel stations working in synchronism, the interconnection being through 66 kV and 33 kV mains. He would also be responsible to the Generation Superintendent for the electrical maintenance of the Port of Spain power station. Applicants must have had experience in the control of a medium-size electrical system. Preference will be given to candidates who are Chartered Electrical Engineers. The yearly salary is £1,000-1,075 at the present size of the system.

PROTECTION AND TEST ENGINEER

Applicants must be graduates in Electrical Engineering. The successful applicant will be responsible to the Distribution Superintendent for the organisation and running of a single and polyphase meter-testing station and standardising laboratory. He will also be responsible for the installation and testing of discriminating protective gear. He may be required to spend the first six months of his appointment with Instrument Manufacturers in the United Kingdom. At the present size of the Undertaking the salary will be £875-950 a year.

Officers recruited from overseas for the posts in Port of Spain will receive a housing allowance of a maximum of £10 8s. 4d. a month, depending upon salary and the actual cost of accommodation. Free passages are provided for the overseas appointee and family not exceeding four persons. An incidental expenses allowance of £60 will be granted on appointment. 45 days per annum vacation leave accumulated up to three years will be allowed. All appointees recruited from overseas shall be entitled to free first-class passages to the United Kingdom on leave for himself, his wife and up to two children under 18 years of age on completion of every three years service in accordance with the regulations of the Commission.

A temporary Cost of Living Allowance of £25 per year is payable on all salaries.

Applications should be in writing and, in addition to giving full details of training and experience, should give the names of two referees. Applications should be sent by air-mail to P.O. Box 121, Port of Spain, Trinidad, B.W.I., and should reach me on or before February 28, 1953.

General details of Trinidad's climate, income tax, etc. can be obtained from the West India Committee at 40 Norfolk Street, London, W.C.2.

KENNETH W. FINCH,
General Manager.
(C 517)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF THIRD ASSISTANT ENGINEER
Sub-Area Mains Department, Preston

APPLICANTS should have had a wide experience in the construction, operation and maintenance of large industrial and rural networks, including o/h lines and u/g cables at voltages up to 33 kV, and in high voltage testing and fault localising. The person appointed will be required to undertake standby duty.

Salary scale: £719-£750 p.a. Grade K.10. N.J.B. conditions.

Applications to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune Street, Preston, by February 14, 1953.

APPOINTMENT OF SENIOR DRAUGHTSMAN
Mains Department, Sub-Area Headquarters, Kendal

Applicants should have had experience in layout of indoor and outdoor sub-stations up to 33 kV, overhead line design, and the preparation of schematic and protective system diagrams. Ability to take charge of drawing office essential. Possession of H.N.C. or equivalent will be an advantage.

Salary scale, £567-£671 p.a. Schedule "D," Grade 5. N.J.B. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by February 14, 1953. (C 534)

SOUTH EASTERN ELECTRICITY BOARD

DEMONSTRATOR (FEMALE)
West Kent District

SALARY, £380 by £20 to £460 by £10 to £470 p.a., plus London Weighting under N.J.C. Grade 1. Applicants should possess a recognised diploma or certificate in domestic science and the E.A.W. Certificate. The person appointed will be required to conduct lectures and demonstrations, advise consumers and generally assist in service centres.

Applications, on forms obtainable from P. S. Watson, M.I.E.E., West Kent Manager, SEEBoard, 270 High Street, Orpington, Kent, to be returned to him by February 17, 1953.

A. L. BURNELL,
Secretary.

January, 1953. (C 556)

JERSEY ELECTRICITY CO. LTD.

DEPUTY MANAGER

THE above post will be vacant shortly and immediate applications are invited from qualified Electrical and Mechanical Engineers within the age limits 35 to 42.

The Company supplies the whole of Jersey, it operates a diesel station of 15 mW capacity, has approximately 17,000 consumers and has a large electrical contracting and refrigeration department.

Applicants, who should have comprehensive engineering and administrative experience in the supply industry, can be assured that the post offers plenty of scope and responsibility. Commencing salary will be £1,000 p.a.

Applications, which must be by letter, should be endorsed "Deputy Manager" and addressed to the Manager, Jersey Electricity Co., Ltd., 11 Broad Street, St. Helier, Jersey, C.I. (C 516)

SCUNTHORPE HOSPITAL MANAGEMENT COMMITTEE

PHYSICS DEPARTMENT TECHNICIAN

IMMEDIATE vacancy for Technician in Physics Department of Radiotherapy Centre to assist in instrument making, laboratory work and X-ray plant maintenance. Applicants with knowledge of building and servicing electronic equipment preferred. Electrical engineering qualifications and experience in other aspects of the work advantageous. Some radiation work will have to be undertaken. Whitley Council terms, present salary scale £410 by £15 (3) and £20 (1) to £475. N.H.S. Superannuation Scheme.—Apply, naming two referees, to Secretary, War Memorial Hospital, Scunthorpe, Lincs. (C 510)

STEVENAGE DEVELOPMENT CORPORATION

ASSISTANT ELECTRICAL ENGINEER required in Chief Architect's department on salary grades of £475 by £25 to £645 per annum, according to experience. Technical qualifications should be at least O.N.C. and experience should cover preparation of drawings and specifications for electrical installations in houses, public buildings and small factories. Applications, stating age, experience, positions held and names of two referees, should be sent to the Chief Administrative Officer, Aston House, nr. Stevenage, Herts, not later than February 21, 1953.

January 20, 1953. (C 538)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, ELECTRICAL FITTERS, E.H.T. JOINTERS and LINESMEN (overhead power—over 60,000 volts) in West Central Sub-Area, Pontardulais, Swansea.

Rate of pay, 3s. 6½d. per hour; 44-hour, five-day week. N.J.I.C. conditions.

Applications stating age, details of training and experience to Sub-Area Manager, South Wales Electricity Board, Fforestfach, Swansea, by February 14, 1953. (C 571)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 4 (Leeds) Sub-Area

Leeds District
CONSUMERS' ENGINEER
(COMMERCIAL DEPARTMENT)

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold qualifications leading to such membership, and must have had a sound training and subsequent experience in the work of a consumers' engineer, and be capable of giving advice to all classes of consumers regarding utilisation.

Details should be given of experience in the following matters:—

Negotiations with consumers requiring electricity supplies, application of I.E.E. Wiring Regulations and other relevant regulations in testing and inspecting consumers' installations, tariffs, sales development, control of staff and work people.

Salary, N.J.B., Class "J," Grade 7, £817 to £852 per annum.

Applications, giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than February 15, 1953. (C 572)

A VACANCY exists for an experienced ENGINEER to take charge (under a Departmental Manager) of the production of dry-core telephone cables. Applicants must have good knowledge of the technical requirements of such cables and experience of the type of machinery used for its production. Initiative in devising improved techniques is required, together with the general engineering and administrative ability necessary for running a busy factory at high output. Preferred age is between 30 and 45 years.—Applications, stating salary range in which interested, to be made in writing only, to the Works Manager, Pirelli-General Cable Works, Ltd., Eastleigh, Hants, not later than February 26, 1953. (C 529)

ACCOUNTANT. An Assistant Accountant for service in Nigeria, preferably with experience in an Electrical Supply Undertaking. Probationary/permanent post or on Contract terms at commencing salary of £660 per annum plus £240 expatriation allowance rising to £1,200 p.a. Age 25-35. Experience of budgetary control together with knowledge of internal audit work. Tours 18-24 months with liberal leave on full pay, free air passage out and home. Furnished quarters at low rental.—Forms of application from Liaison Officer, The Electricity Corporation of Nigeria, 11 Manchester Square, London W.1. (C 527)

APPLICATIONS are invited for the position of ASSISTANT GENERAL MANAGER (with the chance of succession) of a large company making all types of electric cables in the South of England. Experience in cable making is a desirable though not an essential qualification, but a sound general education and fundamental technical engineering training as well as experience of management or administration in an industrial undertaking are necessary.—Applications, which will be treated in strict confidence, giving full particulars of education, training and experience, should be sent to Box No. 2363, Electrical Times. (C 528)

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, require ASSISTANT ENGINEER (Operation) at Percival Lane Power Station, Runcorn. Salary £496-£514 per annum, N.J.B., Class "G," Grade 13. Superannuable. Control room experience in a modern generating station desirable.—Application forms obtainable from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date, February 16, 1953. (C 539)

INSTRUMENT ENGINEER

required for London Office.

Engineering degree or professional qualifications with wide practical experience of oil refinery/chemical plant instrumentation. Salary commensurate with responsibilities in this senior post.

Write, giving full details of age, experience.

BOX NO. 2367,
ELECTRICAL TIMES (C 544p)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

B.I.C.C.C. LTD., invite applications for employment in the U.K. and overseas for:—
CONTRACTS ENGINEERS to take charge of work on site on the construction of overhead electric transmission lines on steel towers and wood poles. Applicants should have had experience of this work or of civil and electrical engineering work of a comparable nature.
FOREMEN to take charge of labour engaged on the construction of overhead electric transmission lines on steel towers and wood poles. Applicants should have proved ability to handle labour, and experience of the installation of reinforced concrete foundations for steel towers, or of the installation of overhead lines on wood poles, or of civil and electrical engineering work of a comparable nature.
Applications, giving full details, should be made by letter to the Staff Officer, B.I.C.C.C. Ltd., 21 Bloomsbury Street, London W.C.1. (C 557)

CHEMIST. An Assistant Chemist with Power Station experience for service in Nigeria, ultimate pensionable post subject to satisfactory probationary service. Commencing salary £760 p.a. plus £240 expatriation allowance rising to £1,300 p.a. Age 25-35, B.Sc. plus at least two years' post graduate experience. Tours of 18 to 24 months with liberal leave on full pay. Free air passages out and home. Furnished quarters at low rental. —Forms of application from Liaison Officer, The Electricity Corporation of Nigeria, 11, Manchester Square, London, W.1. (C 526)

DRAUGHTSMEN required for Transformer Drawing Office, previous experience of Power Distribution, Radio, or Welding Transformers is desirable. Progressive positions are offered to men with initiative in expanding Department of modern works on Merseyside. Housing assistance available for selected applicants.—Reply, giving details of age, experience, present occupation and quoting Ref. AFA to Box No. 2565, Electrical Times. (C 543)

ELECTRICAL DRAUGHTSMAN required for large paper mill by Bowater's Thames Paper Mills, Ltd., at Northfleet, Gravesend, Kent. Must be experienced in layout of power installations, wiring diagrams and switchgear. Some mechanical experience an advantage.—Please state age, experience, qualifications and salary required. (C 512)

ELECTRICAL ENGINEER, young, required to open new offices in London for large electrical engineering and contracting organisation. Some technical qualifications essential and experience with consulting engineers or electrical contracting firm an advantage. Excellent opportunity for rapid promotion for young man with University Degree or equivalent, and good connection with architects, consultants and large industrialists in London essential.—Apply, stating age, experience and qualifications to Box No. 2359, Electrical Times. (C 518)

ELECTRICAL ENGINEER required by Tin Dredging Co. in Malaya. Experienced in maintenance of a.c. motors up to 400 h.p. Must have extensive practical experience and sound knowledge of theory. Excellent prospects. Applicant should be unmarried and aged between 22 and 32. First contract for three years. Commencing salary £560 to £630 per annum, plus cost-of-living allowance £280 per annum. Free furnished quarters provided. Six months home leave on full pay, plus £140 cost-of-living allowance if contract renewed. Generous non-contributory pension scheme and contributory provident fund.—Written applications, with full particulars of age, education, including studies at technical institute, training and experience and copies of references, to Box No. 160, Walter Skinner, Ltd., 20 Copthall Avenue, London E.C.2. Full details can also be obtained from any Employment Exchange where applications may be made. (C 558)

ESTIMATOR required with experience in preparing tenders for all classes of industrial a.c. and d.c. electrical rotating machinery, switchgear, etc., and familiar with B.S. Specifications. Five-day week. Pension Scheme.—Replies, stating age, qualifications and salary expected, to Personnel Manager, Lancashire Dynamo and Crypto, Ltd., Trafford Park, Manchester 17. (C 492)

EXPERIENCED REPRESENTATIVE required, aged 25-36, for South Eastern Counties and South London. Knowledge of domestic appliances and l.t. switchgear desirable.—Apply by letter, giving full particulars of experience to Sales Manager, Berry's Electrical Limited, 85-96 Newman Street, London W.1. (C 542)

FOREMAN for repair shop. Must be familiar with rewinds up to 500 h.p., static and rotary, and capable of handling mixed labour.—Apply, giving full details, to Simpson Bros. (of Hapton) Ltd., Hapton. (C 436)

GENERAL MANAGER. Well-known Group of Engineering Companies is forming new marketing division to handle industrial sales of a wide range of technical products which already command substantial turnover. Applications are invited for the post of General Manager for this division. Applicants must be professional engineers with wide experience in mechanical services of factories, fuel engineering, etc., such as would be possessed by plant engineer of a large factory. Applicants should also have experience of sales administration and be capable of organising technical sales campaigns. Only men of first-class education and background will be considered. Starting salary £1,500 to £2,500 per annum depending on status and experience. Contributory Pension Scheme.—Apply, Box No. 2377, Electrical Times. (C 573)

IMMERSION HEATER SALES REPRESENTATIVE required for Lancashire and Yorkshire. Permanent appointment. Salary, commission and expenses. Pension scheme.—Replies, in confidence, to Gillott Electro Steam Cookers Ltd., Cotswold Works, Chalford, Stroud, Gloucester. (C 574)

IMPERIAL CHEMICAL INDUSTRIES LTD., General Chemicals Division, invite applications for the following vacancies :—
SENIOR ASSISTANT ENGINEER (GENERATION), P/1
Applications are invited for the position of additional senior assistant engineer in the Generation Section of the company's Power Department, Runcorn, Cheshire. The duties are to assist, under the direction of the Generation Section manager in the headquarters of the department with the operation and maintenance of the division's power stations, which have an installed capacity of more than 100,000 kW and with the design of extensions thereto. Applicants, who should be between the ages of 30 and 38 years, and should hold a degree in mechanical or electrical engineering, must have had a sound mechanical engineering training and should have had considerable experience of the operation and maintenance of large modern high-pressure steam power stations. In addition they should have had some experience of the preparation of designs and specifications for new plant and of investigations and tests in connection therewith, while Corporate Membership of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers is also desirable. Commencing salary, up to £1,250. The selected candidate will be required to pass a medical examination and to join the company's pension fund.
SENIOR ASSISTANT ENGINEER (MECHANICAL), P/2
Applications are invited for the position of additional senior assistant engineer in the Mechanical Section of the company's Power Department, Runcorn, Cheshire. The duties are to assist, under the direction of the Mechanical Section manager in the headquarters of the department, with the maintenance of the mechanical equipment of the division's power stations, which have an installed capacity of more than 100,000 kW, and with the design of extensions thereto. Applicants, who should be between the ages of 30 and 38 years, and should hold a degree in mechanical engineering, must have had a sound mechanical engineering training and should have had considerable experience of the maintenance and design of the mechanical equipment of large modern steam power stations. In addition, they should have had some experience of the preparation of designs and specifications for new plant and investigations and tests in connection therewith, while Corporate Membership of the Institution of Mechanical Engineers is also desirable. Commencing salary up to £1,150. The selected candidate will be required to pass a medical examination and to join the company's pension fund.
Applications in writing, giving age and full particulars of education, technical qualifications, engineering training and power station experience, should be sent to the Staff Manager, Imperial Chemical Industries Ltd., General Chemicals Division, Cunard Building, Liverpool 3, quoting reference P/1 or P/2 as appropriate. (C 437)

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, General Chemicals Division, invite applications for the position of ASSISTANT ENGINEER in the Company's Power Department, Runcorn, to take charge of the operation of a number of groups of Lancashire and Economic type boiler. Applicants, who should not be more than 40 years of age, should have had a sound practical and technical training in mechanical engineering and should hold a Higher National Certificate in Mechanical Engineering or equivalent qualification. They should have had good experience of the operation and maintenance of steam boilers and their auxiliaries and should be able to carry out investigations into the thermal performance of such plants.—Apply in writing, giving full particulars, to Staff Manager, Imperial Chemical Industries Limited, General Chemicals Division, Cunard Building, Liverpool, 3 (quoting P/4). (C 531)

SIMPLEX ELECTRIC COMPANY LIMITED

HAVE A VACANCY FOR A

SWITCHGEAR DESIGN ENGINEER

IN THEIR SOUTH AFRICAN FACTORY AT SPRINGS, NEAR JOHANNESBURG.

The position, which carries a good salary, offers excellent prospects.

Applicants must have experience in the design and manufacture of low tension switchgear and must be able to progress new designs from the drawing board to final production.

Apply in writing, stating age, full details of qualifications and experience to:

The Secretary,
SIMPLEX ELECTRIC CO., LTD.
Oldbury, Birmingham. (C 529p)

INTERNATIONAL E.W.F. and R.W.F. Members have MANAGERSHIP VACANCY for well-established branch in the Yorkshire area. Applications are invited when full details of experience should be given to Managing Director.—Box No. 2379, Electrical Times. (C 575)

JOHNSON AND PHILLIPS LTD. require a CHIEF SWITCHGEAR DRAUGHTSMAN for SOUTH AFRICA. Candidates must have good practical and technical training in addition to experience with leading manufacturers, both in drawing and design offices, and preferably be between 30 and 40 years of age.—Applications in writing, giving full particulars of training, experience, age and salary required, to Employment and Welfare Manager, Johnson and Phillips Ltd., Victoria Works, Charlton, S.E.7. (C 463)

LAYOUT ARTIST. Leading electrical manufacturers seek immediately young Assistant Layout man for work in expanding Publicity Dept. (Central London). Work comprises creative layouts for b. and w. and coloured advertisements in technical press, preparation of publicity and sales leaflets, booklets etc. Some experience of display planning and general publicity assistance an advantage.—Write in confidence, giving details of past experience, specimens, and salary required, to Box No. 2361, Electrical Times. (C 519)

NATIONAL COAL BOARD invite applications for a superannuable appointment as CONTROL AND SWITCHGEAR ENGINEER in the mechanical and electrical engineering branch at London headquarters.

Although primarily concerned with control of switchgear the successful candidate will be expected to do other general electrical work. Preference will be given to applicants with some or all of the following qualifications and experience: eligibility for associate membership of the Institution of Electrical Engineers, experience at a manufacturers' works on design, manufacture and application of all types of mining electrical apparatus, experience of electrical engineering at a coal mine.

The salary will be within a range of £1,000 to £1,250 per annum, according to qualifications and experience.

Apply in writing, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates), to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking envelope TT/589. Original testimonials should NOT be forwarded. Closing date, February 21, 1953. (C 540)

PIRELLI-GENERAL CABLE WORKS, LTD., require Transmission Line SURVEYORS with experience on wood poles.—Write, giving full particulars of experience and salary expected, to Overhead Lines Department, Eastleigh, Hants. (C 541)

REPRESENTATIVE required for industrial electrical sales. Must be experienced. Pension and life assurance.—Write, stating age, experience, salary required, etc., to the Secretary, E. A. Wood, Limited, 100 Aston Road, Birmingham 6. (C 559)

REQUIRED, synchronous motor PRODUCTION ENGINEER, capable of organising and taking control of a works department shortly to be started for the production of small synchronous motors. South of England. Only applicants with full experience of this type of work should apply.—Write, stating particulars, salary required, etc., Box No. 2369, Electrical Times. (C 560)

RILEY AND NEATE, LTD., have vacancies for SENIOR and JUNIOR ENGINEERS with good university degrees to supervise the erection of steel tower and wood pole transmission lines. Pension scheme.—Write giving experience, age, health and other details to Head Office, The Abbey Mill, Winchester. (C 576)

TECHNICAL ENGINEER required to assist in department dealing with the design and operation of power plant projects. Qualifications must include a British University degree in either mechanical engineering or in physics, and any two of the following:—

(a) Practical experience of the operation of large steam-raising and/or power-generating plant.
(b) Experience of design of power and steam-raising plants in project stages.
(c) Experience in testing of boilers, turbines, cooling towers, dust extraction plant, etc.
(d) Experience in the project design of large instrument and automatic control systems for thermal power plant.

Applications, giving age and full details of experience and qualifications, should be addressed to the Secretary, Ewbank and Partners Ltd., Engineering Consultants, 10-11 Grosvenor Place, London, S.W.1. (C 470)

TRANSFORMER ENGINEER required conversant with the design and manufacture of power and distribution transformers up to 2,500 kVA 33 kV. Semi-detached house available for suitable applicant.—Reply, giving details of age, experience and salary required to the Chief Transformer Engineer, London Transformer Products, Ltd., Bridgend, Glamorgan. (C 488)

TWO TRAVELLERS required. Connections with electrical retail trade. Sole agents. London area only. Ten per cent. commission. Thames dividing line. Opportunity, young firm offering high-class fittings.—Write: Box No. 2371, Electrical Times. (C 561)

APPOINTMENTS FILLED

THE Advertiser under Box E.T. 826 for a SENIOR ASSISTANT ENGINEER, thanks applicants for replying, and advises the appointment is now filled. (C 562)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (C 16)

PROFILE CUTTING, accuracy assured, latest "Hancock" machines. Contract or job. Templates made if required.—R. F. Fielding and Co., Myrtle Farm Works, Erith, Kent (Erith 2635). (C 456)

WIREWORK inquiries invited. Guards, screens, partitions, baskets, trays, panels, machinery and window guards, etc.—Wire Products (Denton), 96 Town Lane, Denton, Lancs. Tel.: Denton 2470, 3901/2. (C 352)

WIREWORK inquiries invited. Guards, screens, partitions, baskets, trays, panels, machinery and window guards, etc.—Wire Products (Denton), 96 Town Lane, Denton, Lancs. Tel.: Denton 2470, 3901/2. (C 353)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2347, Electrical Times. (C 472)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co. Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (C 10)

ALTERNATORS, 2·75 kVA. by Crompton Parkinson, required in quantities.—Box No. 2373, Electrical Times. (C 563)

D.C. 460 V 25 h.p. shunt interpole MOTOR, with ball or roller bearings, speed somewhere near 360 r.p.m.—Parry's (Electrical Engineers), Ltd., 32 Russell Street, Liverpool 3. (C 564)

SINGLE-BLADE minimum 2 ft rotary CEILING FANS, 220-240 V, required.—Richard Hicks, 65-69 Shelton Street, W.C.2. (C 565)

TWO 35/40 h.p. SQUIRREL CAGE MOTORS 400 V 3-phase, 50 cycles, 2,800 r.p.m. with starters.—Bulpitt and Sons, Ltd., 132 Icknield Street, Birmingham 18. (C 530)

URGENTLY REQUIRED, one 500 V d.c. MOTOR, 70/100 h.p., 500/650 r.p.m., screen protected, shunt or compound wound, continuously or one-hour rated. Maximum head of shaft 1 ft 7½ in., diameter of shaft extension 3¼ in. o.d. or nearest.—Box No. 2375, Electrical Times. (C 568)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (C 6)

WANTED for prompt cash, ferrous and non-ferrous SCRAP: also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (C 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath, Staffs. (C 2)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (C 8)

BUSINESS OPPORTUNITIES

WANTED. EXTRA CAPITAL to enlarge business est. 1928. £500 to £1,000.—Box No. 2381, Electrical Times. (C 578)

FOR SALE

CABLES & WIRE

FOR SALE, 47 silk-covered Eureka WIRE; 500 lbs.; as new.—Box No. 2349, Electrical Times. (C 473)

ENGINEERING PLANT & MATERIALS

FOR SALE: 30 tons of New Hot Rolled Mild Steel Strip, soft welding quality; in coils of continuous length. Widths 5 in. to 9 in., 3g to 15g. Licence required.—Apply: J. D. White, Ltd., Harewood Works, Thornaby-on-Tees. (C 532)

40 TONS F/C STEEL ROUNDS, 30 tons SHEETS, under current prices.—Dyas and Fowle, 41 Loudoun Road, N.W.8. Tel.: MAI 5489, 9641. (C 504)

GENERATING PLANT

STEAM-DRIVEN GENERATING SETS, 665 kVA (500 kW). Steam-driven ALTERNATOR SET by Bellis and Morcom/Siemens, for 5,000/3/50, 77 amps. Steam pressure 150/155 lb. Speed 333 r.p.m.

313 kVA steam ALTERNATOR SET by Browett Lindley Westinghouse, for 400/440/3/50, 4-wire, 452/410 amps, 428 r.p.m. Steam pressure 160/200 lb. exhausting to vacuum or atmosphere. Total temperature up to 537° F. Makers advise that with steam at 180/200 lb. could be operated with 5/10 lb. back pressure.

George Cohen, Sons and Co., Ltd., Wood Lane, London W.12 (Tel.: Shepherds Bush 2070), and Stanningley, nr. Leeds (Tel.: Pudsey 2241). (C 567)

LIGHTING EQUIPMENT

Data on Lighting

in recent Philips Publications

Fluorescent Lighting

Prof. C. ZWIKKER'S handbook sets forth theory, construction and operation:
248 pp. 180 illus. 35s. (post 9d.)

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FUNKE & ORANJE deal with mercury and sodium lamps for lighting large spaces.
270 pp. 210 illus. 30s. (post 9d.)

Details from Philips distributors, 42a South Audley Street, W.1.

Cleaver-Hume Press

(C 521p)

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each, subject.—F. W. Blanshard, Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (C 17)

METERS

A.C./D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (C 7)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 12)

PREMISES

LINCS.—VACANT, for Sale, new Brick, Steel and Asbestos LIGHT INDUSTRIAL BUILDING (cost to date £3,800, not quite completed); 1,600 f.s., ground floor, generous "Perspex" roof lights, white glazed internal walls, covered loading stages, 300 f.s., first floor offices, mains services, central situation.—Apply, Mawer, Cooper and Burkitt, Market Rasen, Lincs. (C 524)

TRANSFORMERS & CONVERTORS

ONE E.C.C. MERCURY ARC RECTIFIER, a.c. input 200-250 V, 1-phase, 50 cycles, d.c. output 18·2 amps., 2 kW. With spare ammeter.—Apply, Tarmac Ltd., Ettingshall, Wolverhampton. (C 546)

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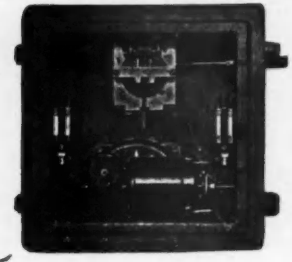

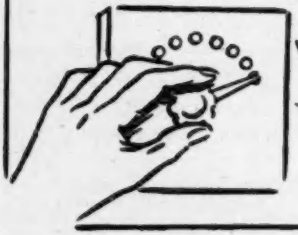

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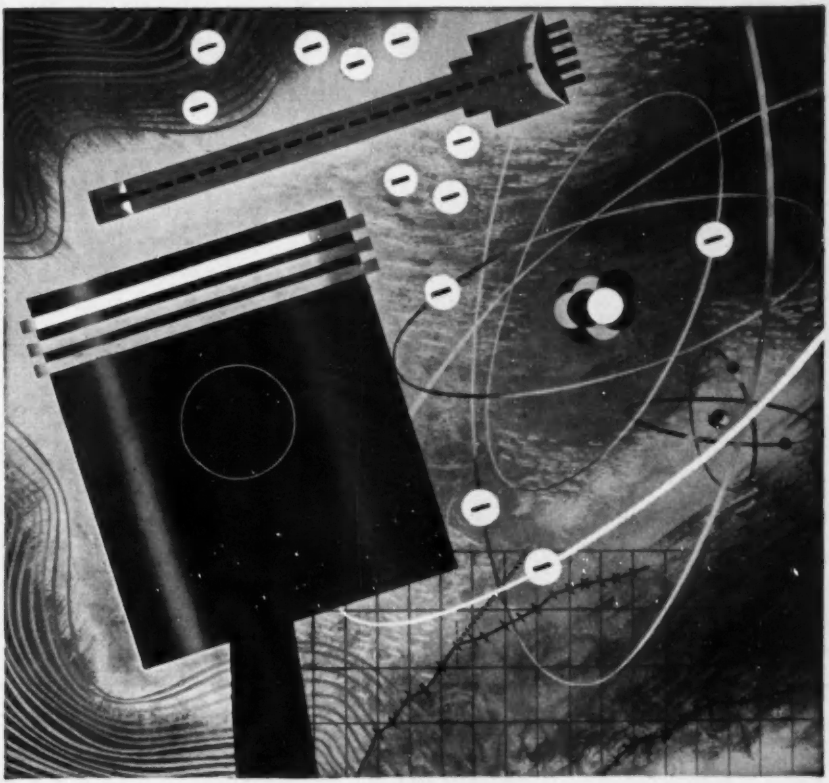

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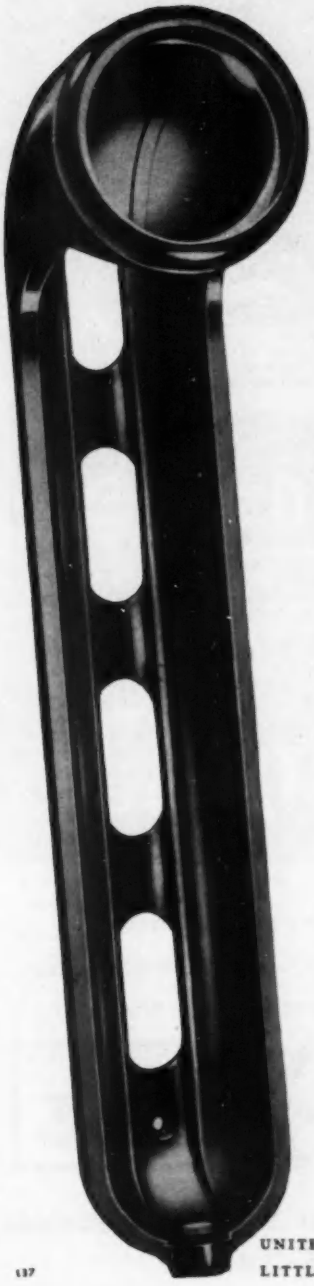

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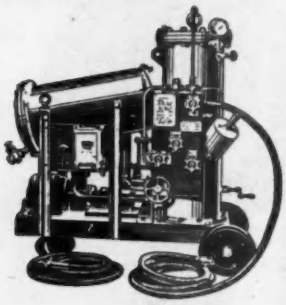

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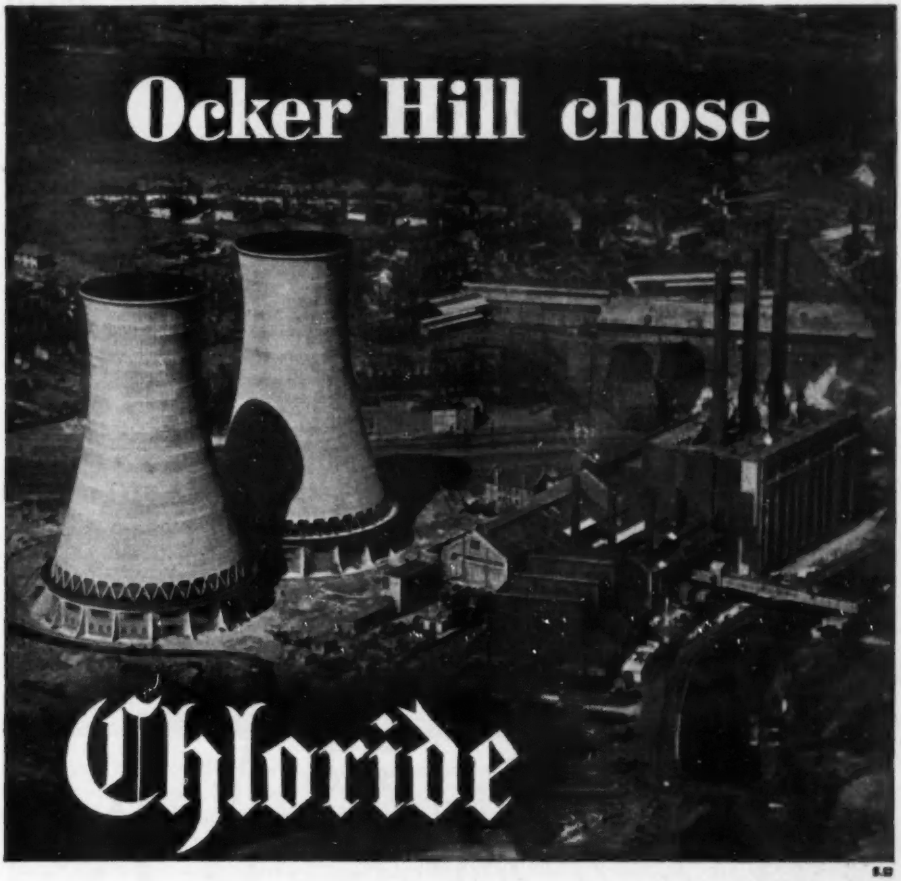

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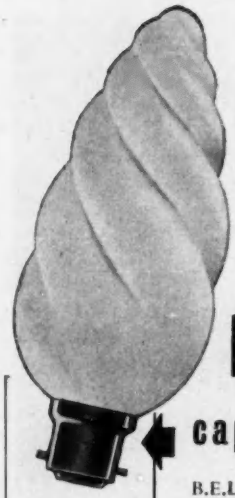

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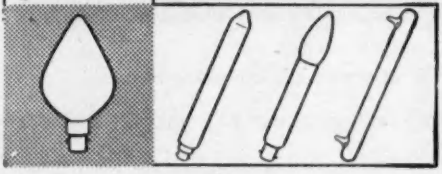

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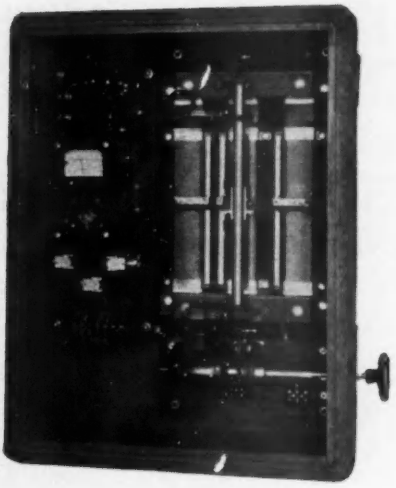

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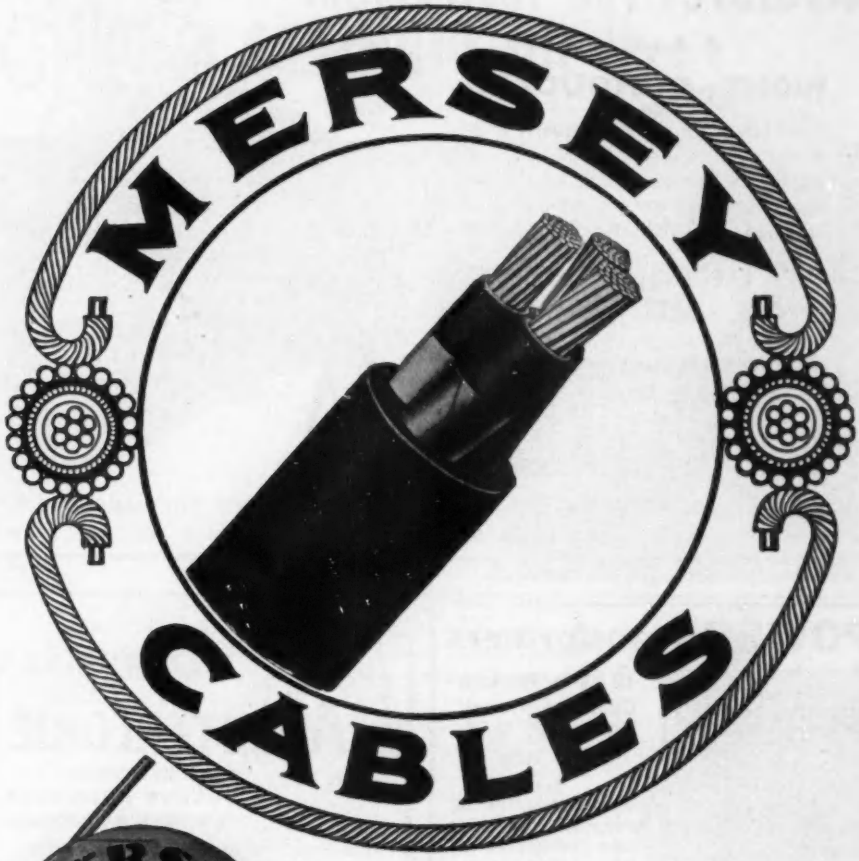

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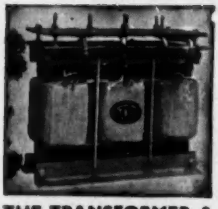

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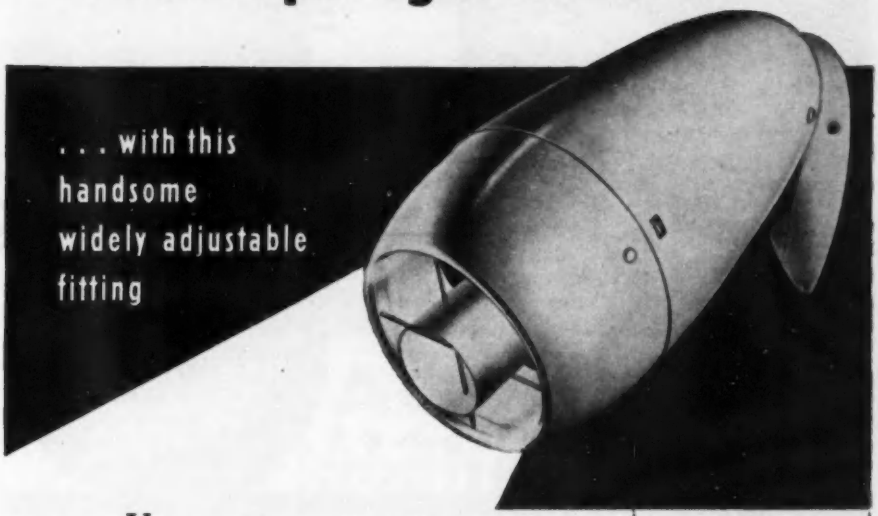

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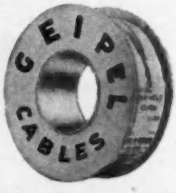

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(Top left)
War Memorial, Oxford, a good example of concentrated floodlighting.

(Below)
Paisley Abbey—typical of many Revo installations.

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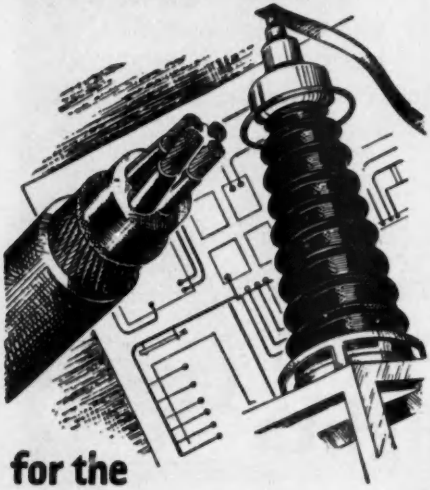

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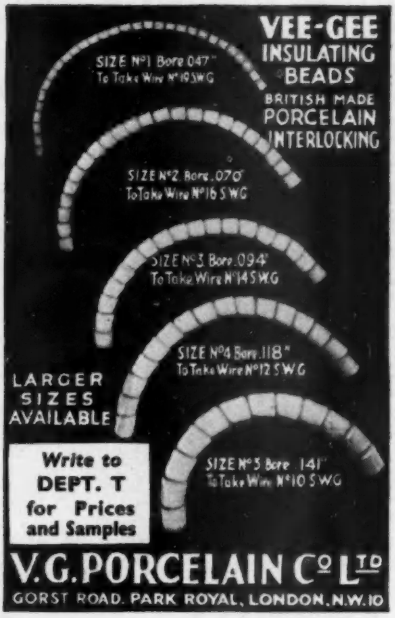

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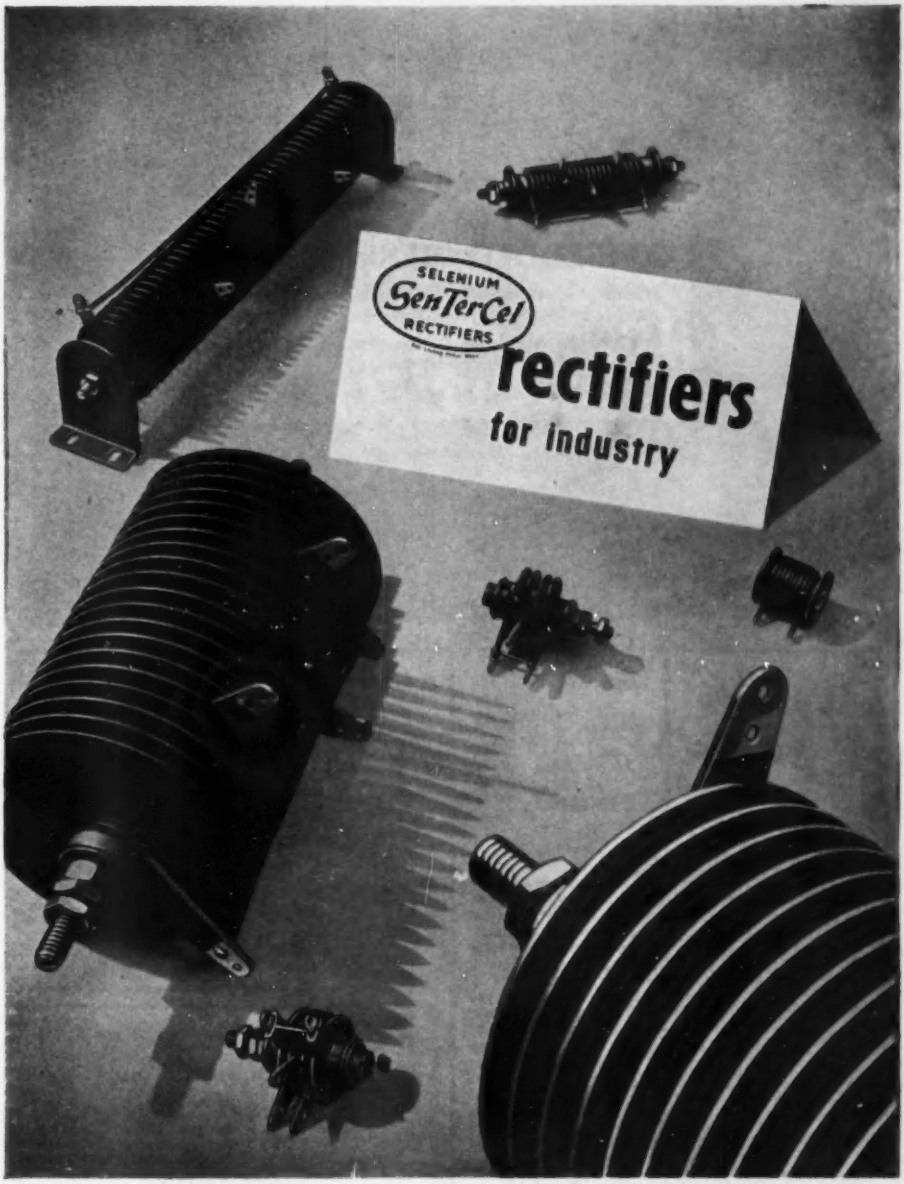

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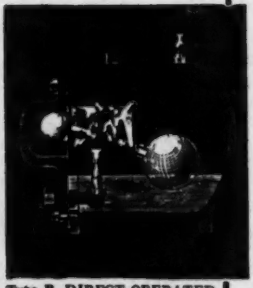

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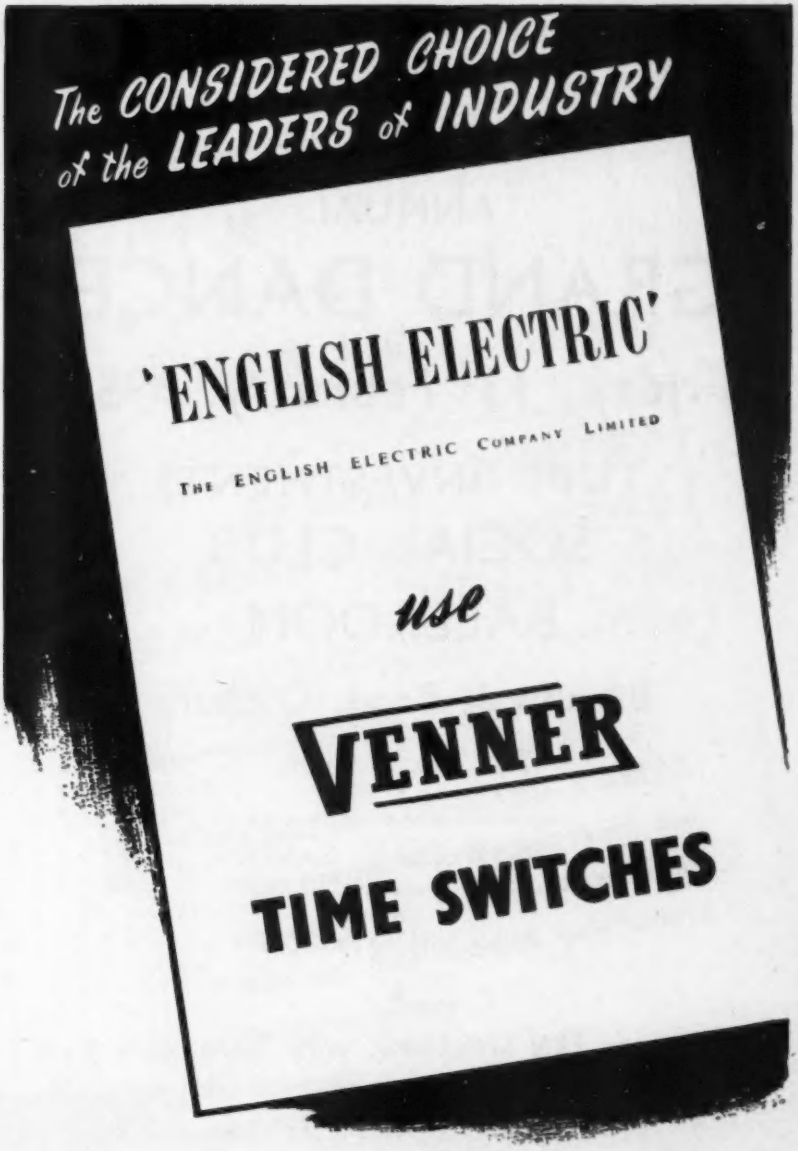

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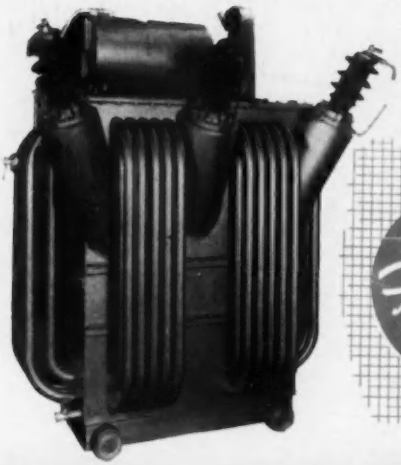

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